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(12) **United States Patent**
Meissner et al.

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(54) **CONTEXTUAL PRESENCE**

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(73) Assignee: **Amazon Technologies, Inc.**, Seattle, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/656,901**

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Related U.S. Application Data

(63) Continuation of application No. 15/395,816, filed on Dec. 30, 2016, now Pat. No. 10,455,362.

(51) **Int. Cl.**

H04W 24/00	(2009.01)
H04W 4/029	(2018.01)
H04L 67/306	(2022.01)
H04W 68/00	(2009.01)
H04W 4/60	(2018.01)

(52) **U.S. Cl.**
CPC ***H04W 4/029*** (2018.02); ***H04L 67/306*** (2013.01); ***H04W 68/005*** (2013.01); *H04W 4/60* (2018.02)

(58) **Field of Classification Search**
CPC ... G01S 19/14; H04L 29/08657; H04L 63/10; H04W 4/02; H04W 4/029; H04W 64/00; H04N 21/2223; H04M 3/42042
See application file for complete search history.

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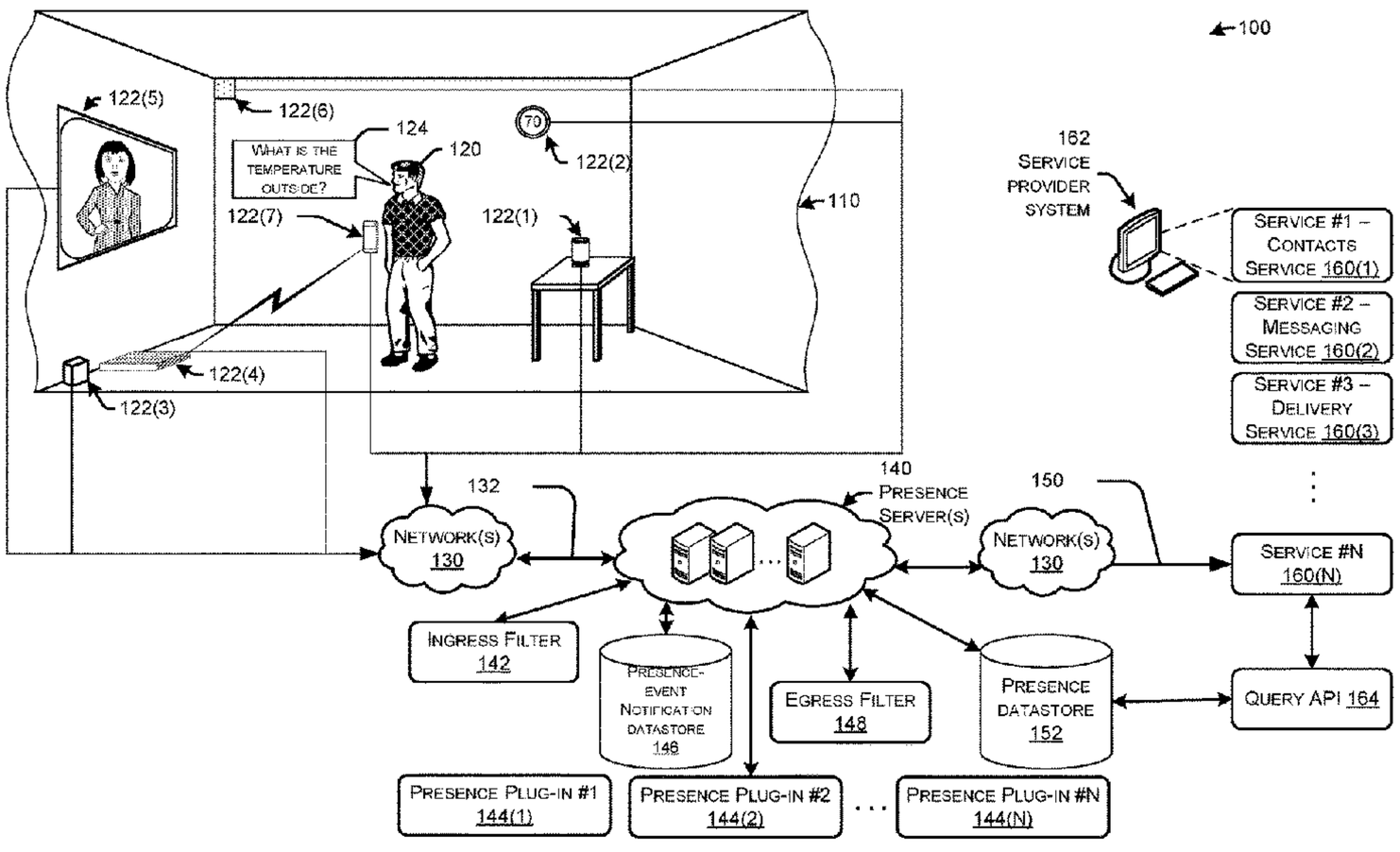
(Continued)

Primary Examiner — Shantell L Heiber
(74) *Attorney, Agent, or Firm* — Lee & Hayes, P.C.

(57) **ABSTRACT**

This disclosure is directed to generating one or more presence-event notifications at one or more user devices associated with a user, and transmitting those presence-event notifications to one or more presence server(s). At the presence server(s) a stream of presence-event notifications may be filtered according to any number of predefined criteria, and then the presence-event notifications that have filtered through may be applied to presence plug-ins to generate presence information associated with user(s) for whom presence-event notifications were received. The presence-event notifications may be provided as a stream of presence information to one or more consumers of presence information and/or stored in a presence datastore. A consumer of presence information, such as a service provider, may request presence information associated with one or more users. In response, the service provider may be provided with the requested presence information based on whether that service provider has permissions to receive the requested presence information.

19 Claims, 16 Drawing Sheets



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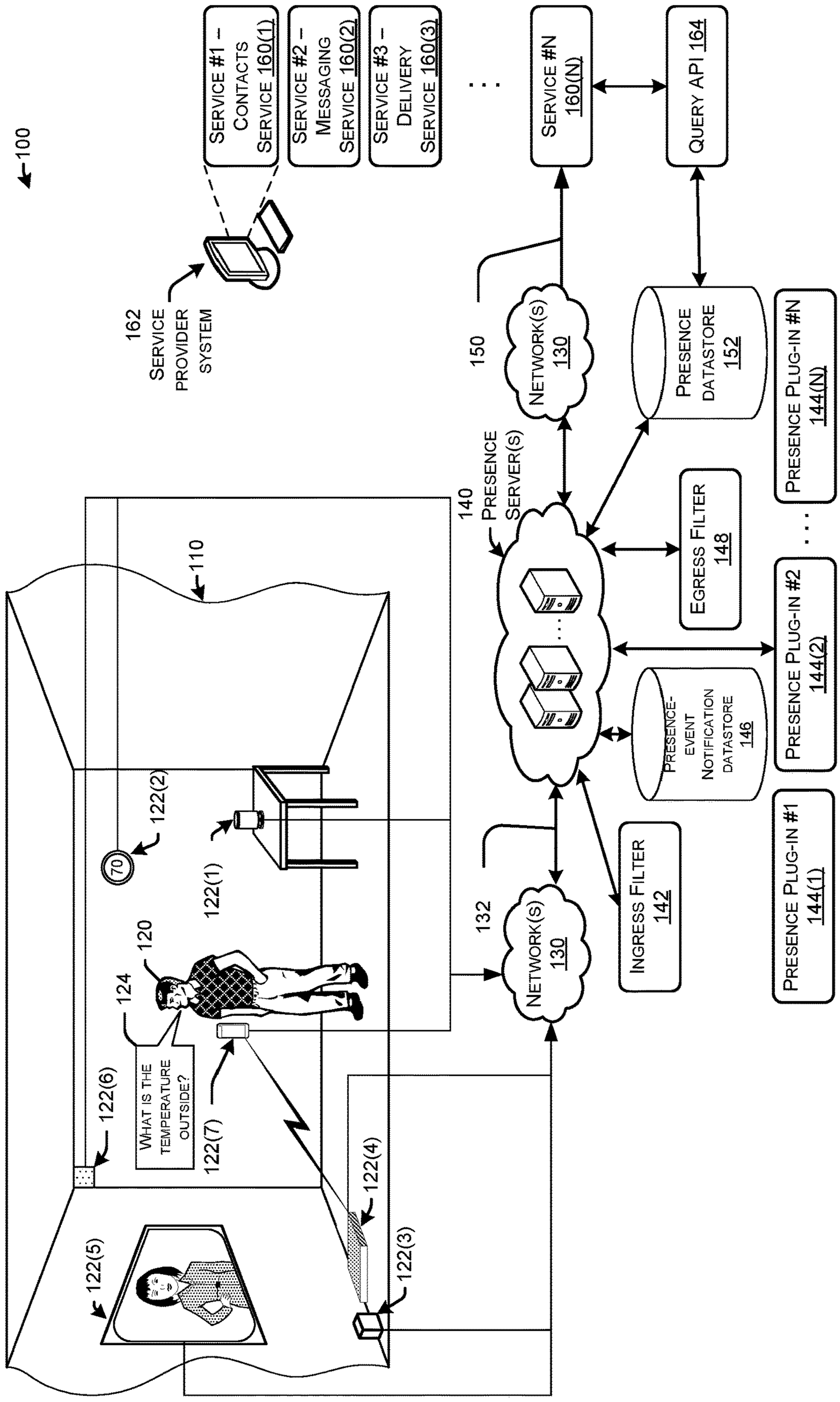
100
SERVICE #1 – CONTACTS SERVICE 160(1)
SERVICE #2 – MESSAGING SERVICE 160(2)
SERVICE #3 – DELIVERY SERVICE 160(3)
SERVICE #N 160(N)
QUERY API 164
162 SERVICE PROVIDER SYSTEM
150
NETWORK(S) 130
PRESENCE DATASTORE 152
PRESENCE PLUG-IN #N 144(N)
140 PRESENCE SERVER(S)
EGRESS FILTER 148
PRESENCE-EVENT NOTIFICATION DATASTORE 146
PRESENCE PLUG-IN #2 144(2)
INGRESS FILTER 142
PRESENCE PLUG-IN #1 144(1)
132
NETWORK(S) 130
110
122(2)
70
122(1)
120
124
WHAT IS THE TEMPERATURE OUTSIDE?
122(6)
122(7)
122(4)
122(5)
122(3)

FIG. 1

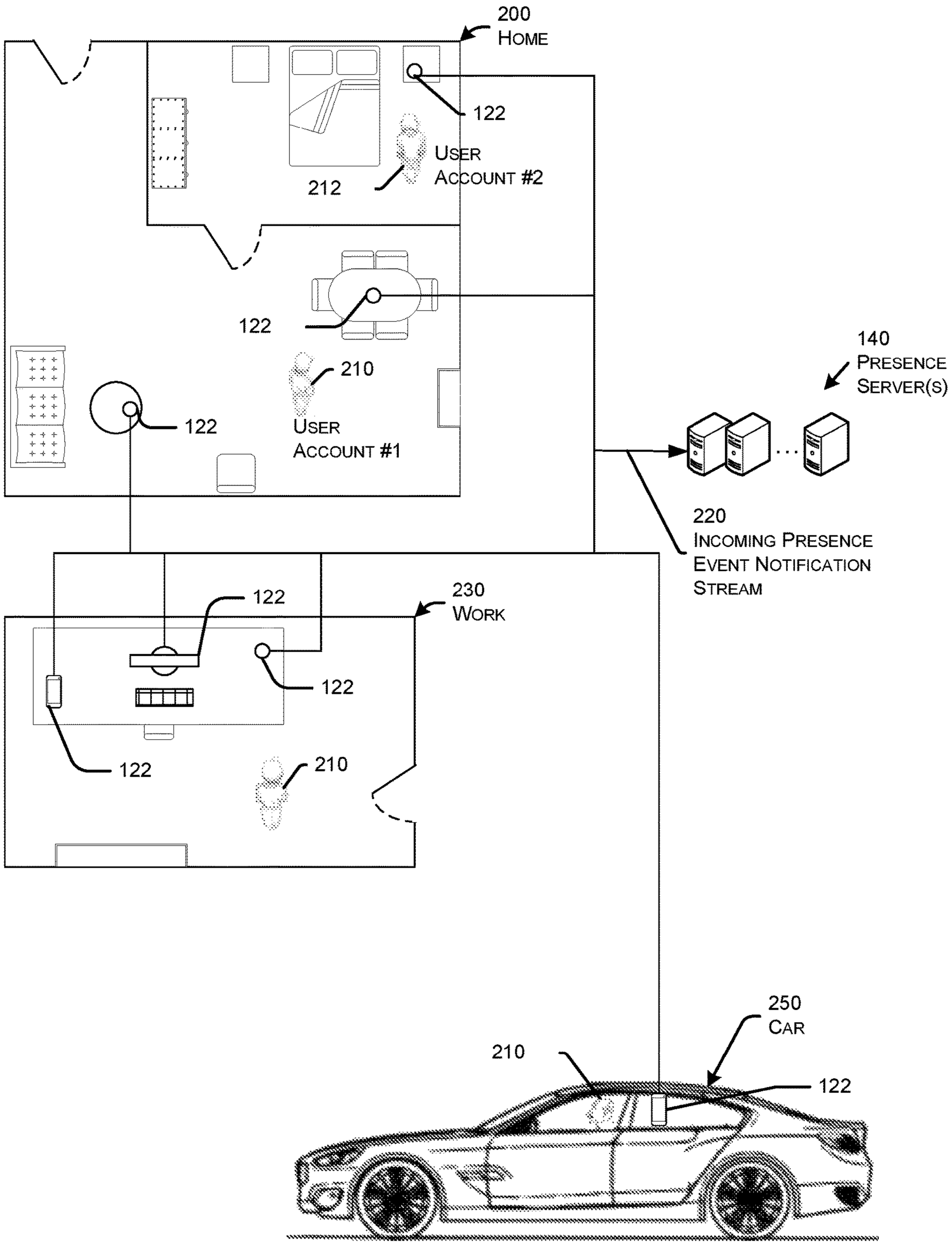
200
HOME
122
USER
ACCOUNT #2
212
122
210
122
USER
ACCOUNT #1
140
PRESENCE
SERVER(S)
220
INCOMING PRESENCE
EVENT NOTIFICATION
STREAM
230
WORK
122
122
122
210
250
CAR
210
122

FIG. 2

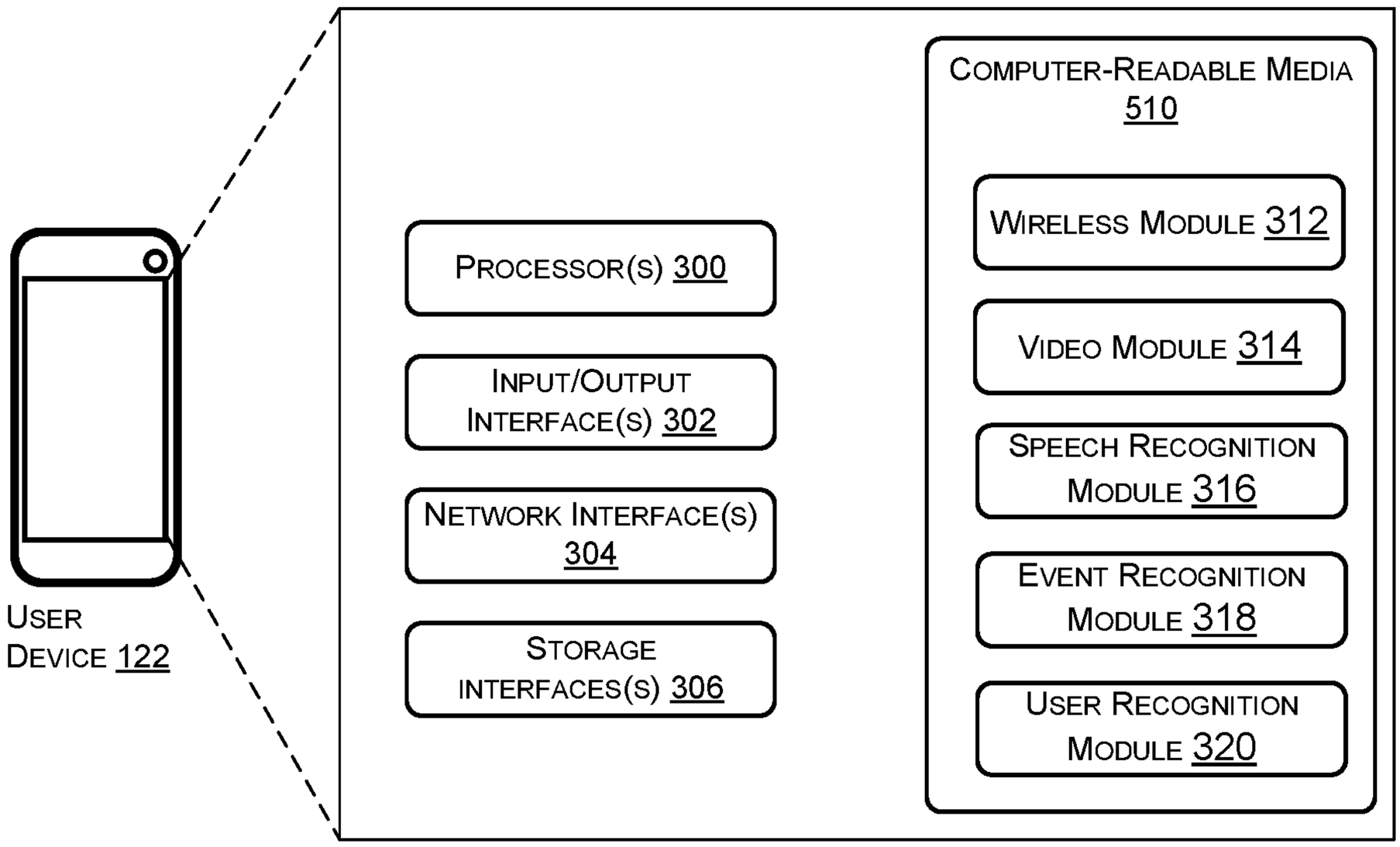
User Device 122
Processor(s) 300
Input/Output Interface(s) 302
Network Interface(s) 304
Storage Interfaces(s) 306
Computer-Readable Media 510
Wireless Module 312
Video Module 314
Speech Recognition Module 316
Event Recognition Module 318
User Recognition Module 320

FIG. 3

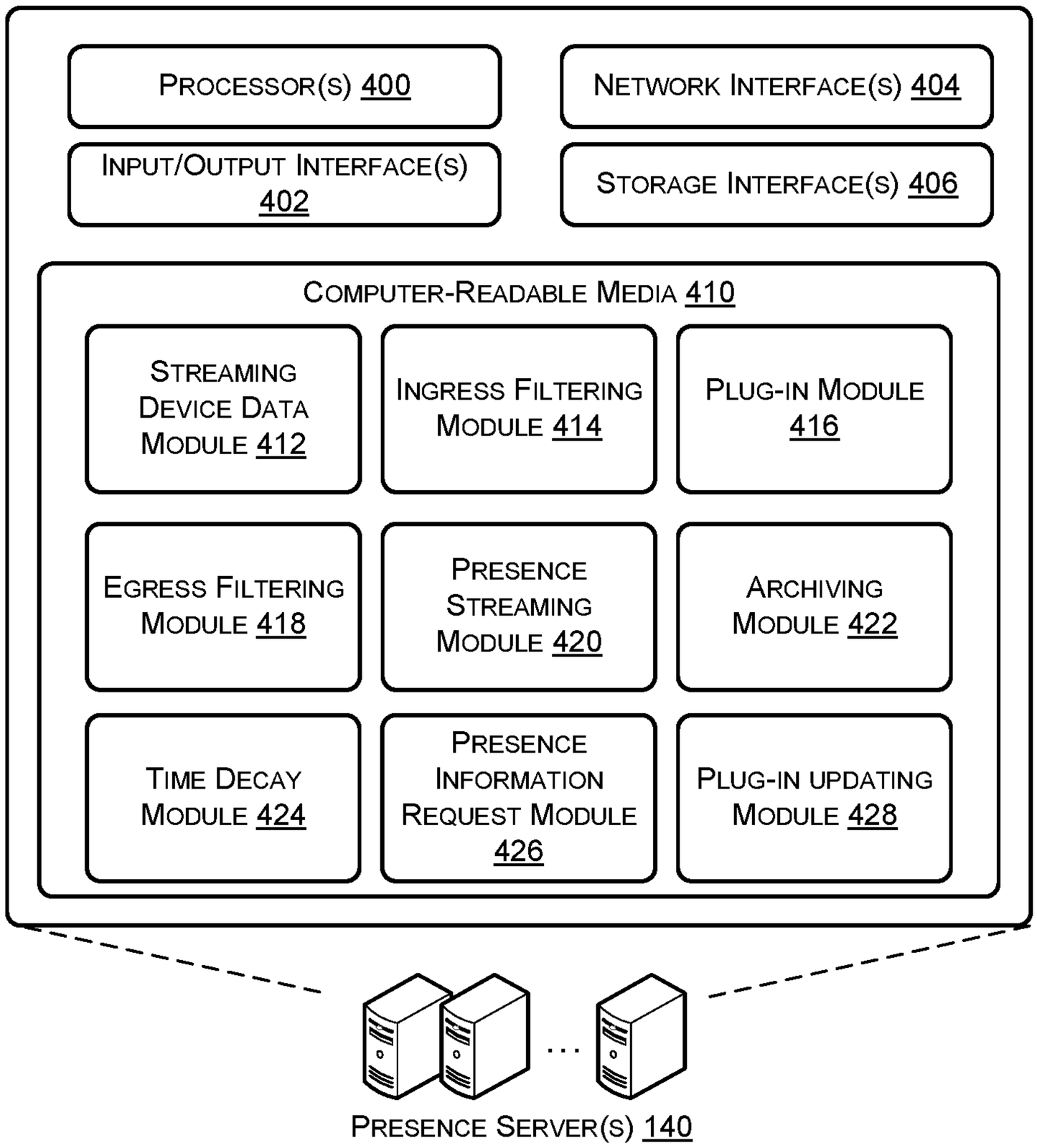
PROCESSOR(S) 400
NETWORK INTERFACE(S) 404
INPUT/OUTPUT INTERFACE(S) 402
STORAGE INTERFACE(S) 406
COMPUTER-READABLE MEDIA 410
STREAMING DEVICE DATA MODULE 412
INGRESS FILTERING MODULE 414
PLUG-IN MODULE 416
EGRESS FILTERING MODULE 418
PRESENCE STREAMING MODULE 420
ARCHIVING MODULE 422
TIME DECAY MODULE 424
PRESENCE INFORMATION REQUEST MODULE 426
PLUG-IN UPDATING MODULE 428
PRESENCE SERVER(S) 140

FIG. 4

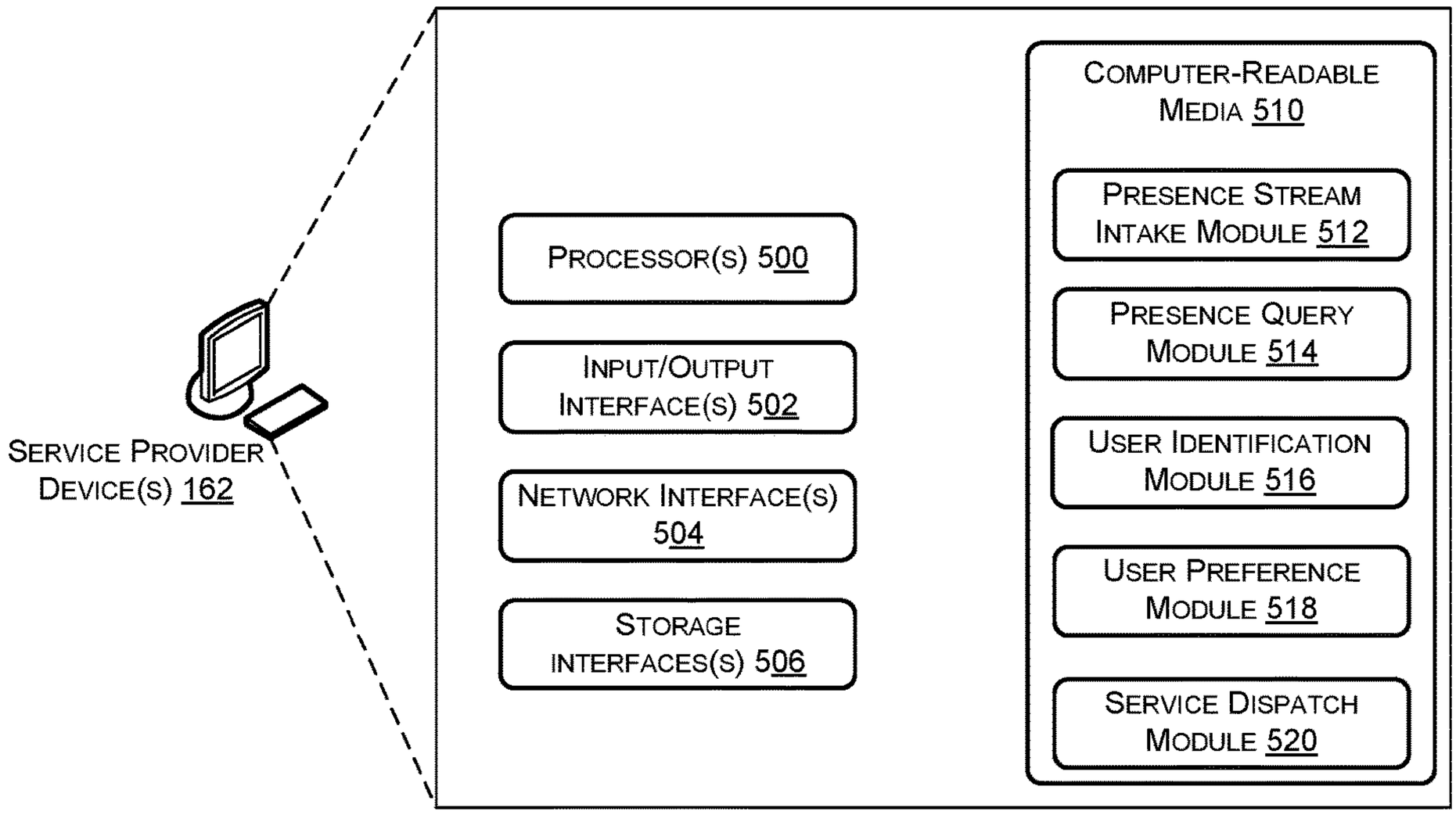
SERVICE PROVIDER DEVICE(S) 162
PROCESSOR(S) 500
INPUT/OUTPUT INTERFACE(S) 502
NETWORK INTERFACE(S) 504
STORAGE INTERFACES(S) 506
COMPUTER-READABLE MEDIA 510
PRESENCE STREAM INTAKE MODULE 512
PRESENCE QUERY MODULE 514
USER IDENTIFICATION MODULE 516
USER PREFERENCE MODULE 518
SERVICE DISPATCH MODULE 520

FIG. 5

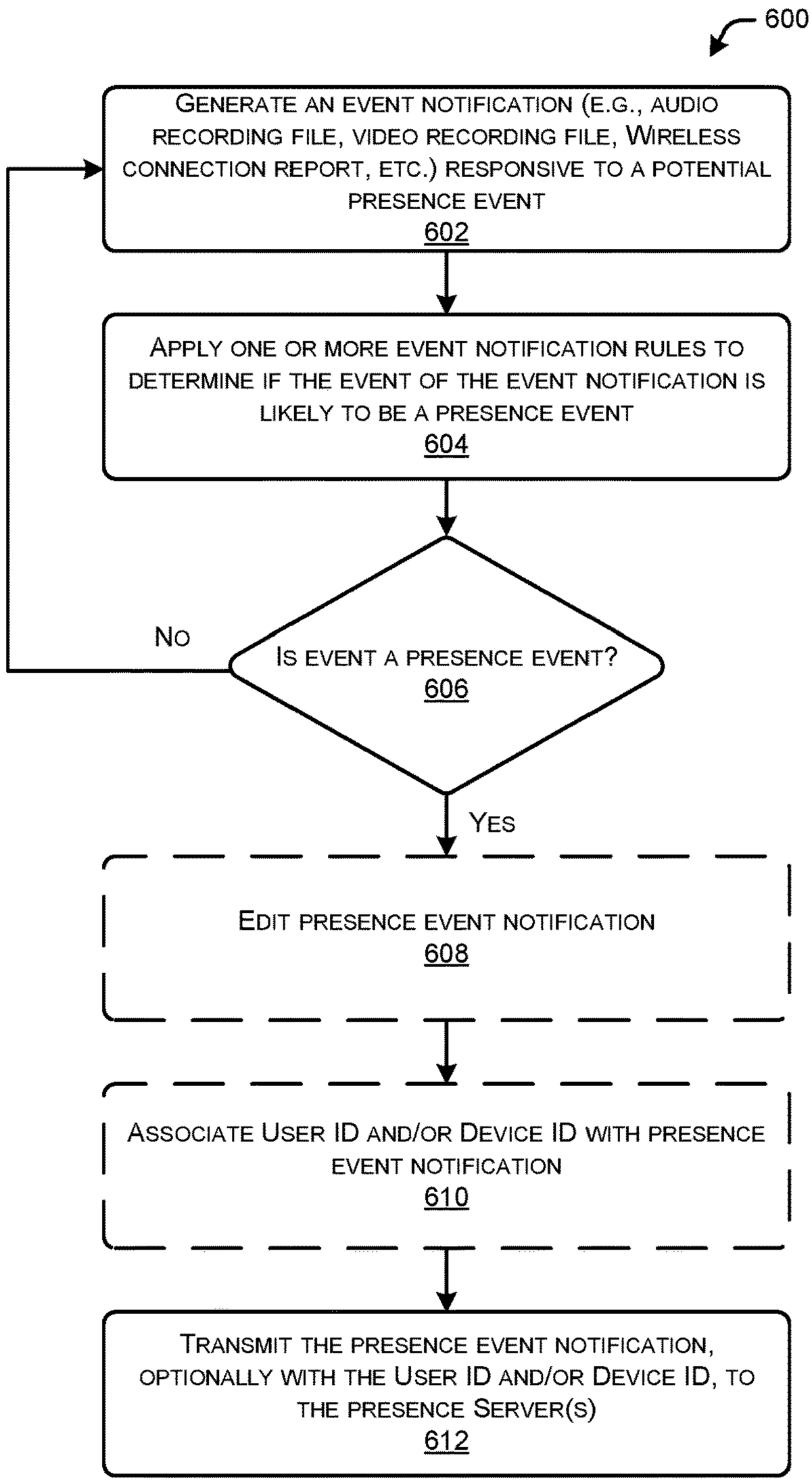
600
GENERATE AN EVENT NOTIFICATION (E.G., AUDIO RECORDING FILE, VIDEO RECORDING FILE, WIRELESS CONNECTION REPORT, ETC.) RESPONSIVE TO A POTENTIAL PRESENCE EVENT
602
APPLY ONE OR MORE EVENT NOTIFICATION RULES TO DETERMINE IF THE EVENT OF THE EVENT NOTIFICATION IS LIKELY TO BE A PRESENCE EVENT
604
IS EVENT A PRESENCE EVENT?
606
NO
YES
EDIT PRESENCE EVENT NOTIFICATION
608
ASSOCIATE USER ID AND/OR DEVICE ID WITH PRESENCE EVENT NOTIFICATION
610
TRANSMIT THE PRESENCE EVENT NOTIFICATION, OPTIONALLY WITH THE USER ID AND/OR DEVICE ID, TO THE PRESENCE SERVER(S)
612

FIG. 6

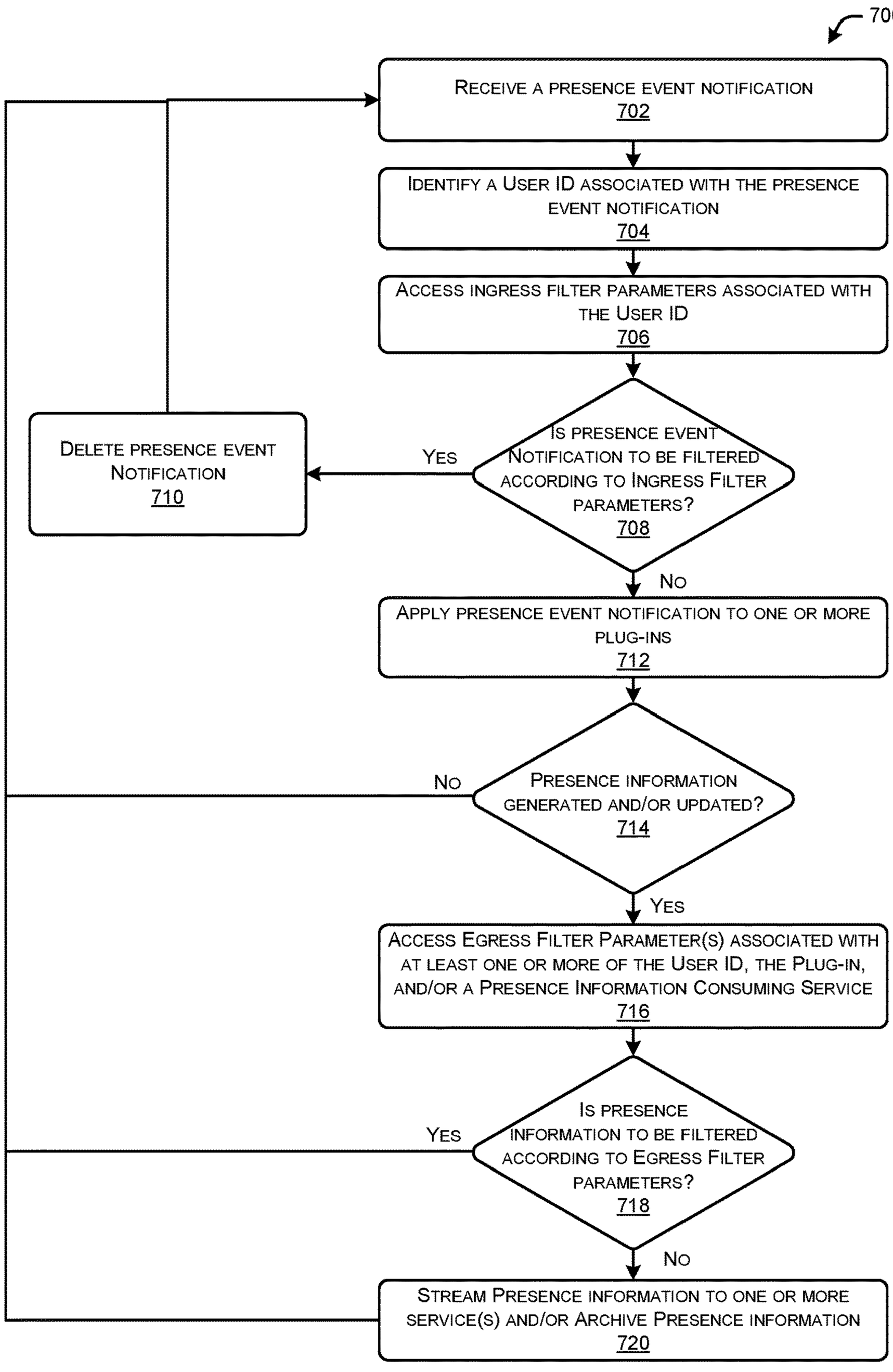
700
RECEIVE A PRESENCE EVENT NOTIFICATION
702
IDENTIFY A USER ID ASSOCIATED WITH THE PRESENCE EVENT NOTIFICATION
704
ACCESS INGRESS FILTER PARAMETERS ASSOCIATED WITH THE USER ID
706
IS PRESENCE EVENT NOTIFICATION TO BE FILTERED ACCORDING TO INGRESS FILTER PARAMETERS?
708
YES
DELETE PRESENCE EVENT NOTIFICATION
710
NO
APPLY PRESENCE EVENT NOTIFICATION TO ONE OR MORE PLUG-INS
712
PRESENCE INFORMATION GENERATED AND/OR UPDATED?
714
NO
YES
ACCESS EGRESS FILTER PARAMETER(S) ASSOCIATED WITH AT LEAST ONE OR MORE OF THE USER ID, THE PLUG-IN, AND/OR A PRESENCE INFORMATION CONSUMING SERVICE
716
IS PRESENCE INFORMATION TO BE FILTERED ACCORDING TO EGRESS FILTER PARAMETERS?
718
YES
NO
STREAM PRESENCE INFORMATION TO ONE OR MORE SERVICE(S) AND/OR ARCHIVE PRESENCE INFORMATION
720

FIG. 7

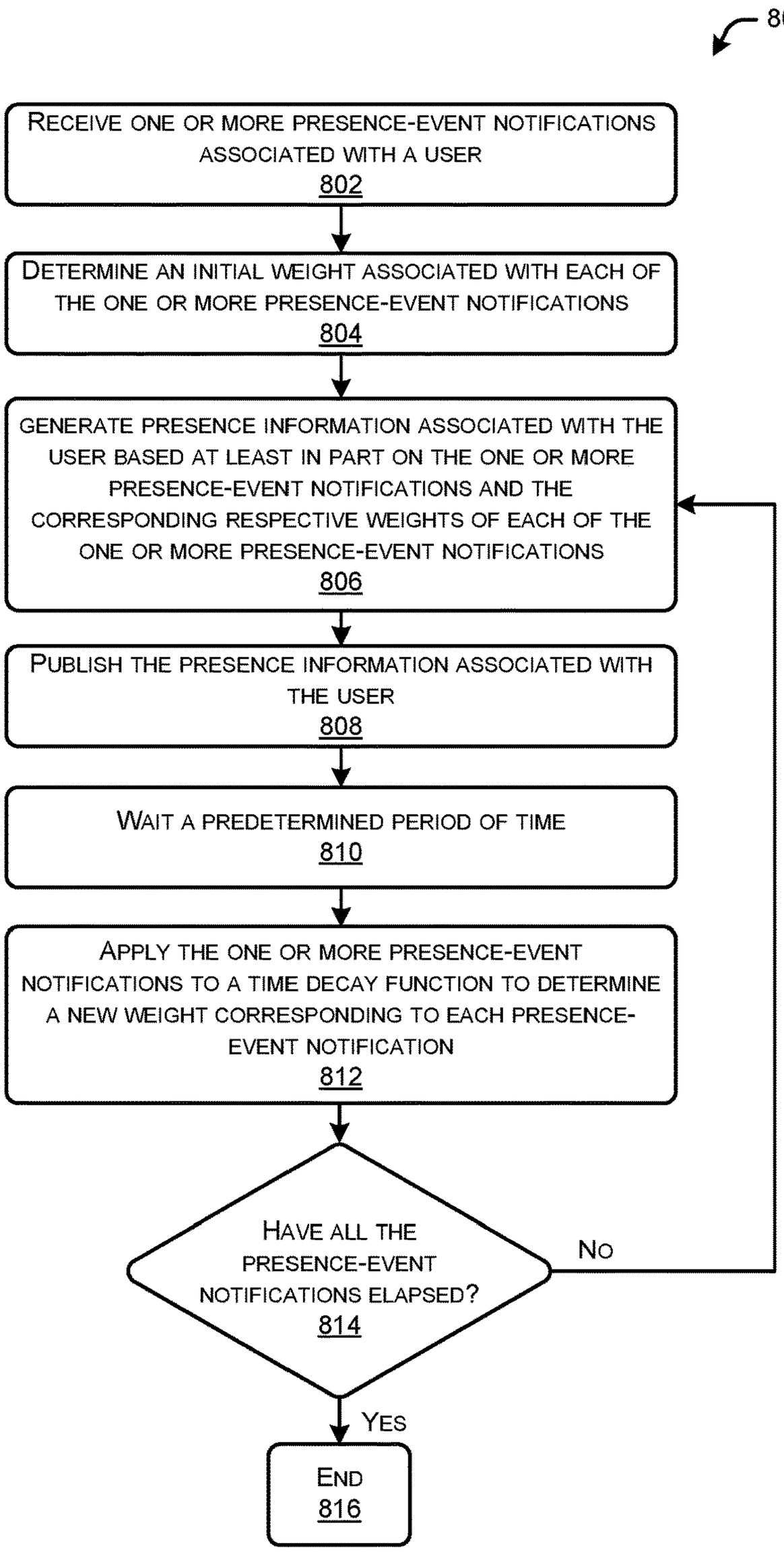
800
RECEIVE ONE OR MORE PRESENCE-EVENT NOTIFICATIONS ASSOCIATED WITH A USER
802
DETERMINE AN INITIAL WEIGHT ASSOCIATED WITH EACH OF THE ONE OR MORE PRESENCE-EVENT NOTIFICATIONS
804
GENERATE PRESENCE INFORMATION ASSOCIATED WITH THE USER BASED AT LEAST IN PART ON THE ONE OR MORE PRESENCE-EVENT NOTIFICATIONS AND THE CORRESPONDING RESPECTIVE WEIGHTS OF EACH OF THE ONE OR MORE PRESENCE-EVENT NOTIFICATIONS
806
PUBLISH THE PRESENCE INFORMATION ASSOCIATED WITH THE USER
808
WAIT A PREDETERMINED PERIOD OF TIME
810
APPLY THE ONE OR MORE PRESENCE-EVENT NOTIFICATIONS TO A TIME DECAY FUNCTION TO DETERMINE A NEW WEIGHT CORRESPONDING TO EACH PRESENCE-EVENT NOTIFICATION
812
HAVE ALL THE PRESENCE-EVENT NOTIFICATIONS ELAPSED?
814
NO
YES
END
816

FIG. 8

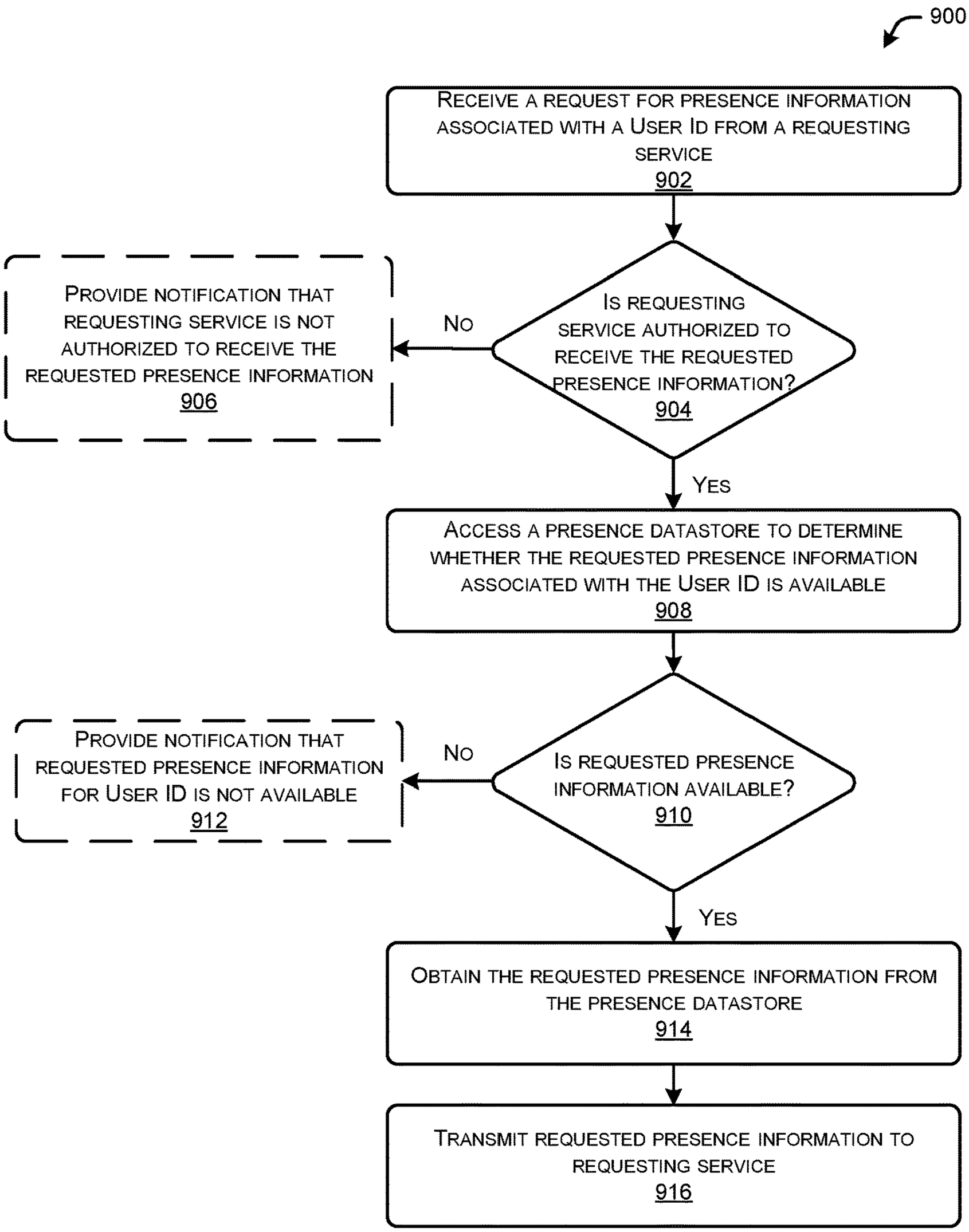
900
RECEIVE A REQUEST FOR PRESENCE INFORMATION ASSOCIATED WITH A USER ID FROM A REQUESTING SERVICE
902
IS REQUESTING SERVICE AUTHORIZED TO RECEIVE THE REQUESTED PRESENCE INFORMATION?
904
NO
PROVIDE NOTIFICATION THAT REQUESTING SERVICE IS NOT AUTHORIZED TO RECEIVE THE REQUESTED PRESENCE INFORMATION
906
YES
ACCESS A PRESENCE DATASTORE TO DETERMINE WHETHER THE REQUESTED PRESENCE INFORMATION ASSOCIATED WITH THE USER ID IS AVAILABLE
908
IS REQUESTED PRESENCE INFORMATION AVAILABLE?
910
NO
PROVIDE NOTIFICATION THAT REQUESTED PRESENCE INFORMATION FOR USER ID IS NOT AVAILABLE
912
YES
OBTAIN THE REQUESTED PRESENCE INFORMATION FROM THE PRESENCE DATASTORE
914
TRANSMIT REQUESTED PRESENCE INFORMATION TO REQUESTING SERVICE
916

FIG. 9

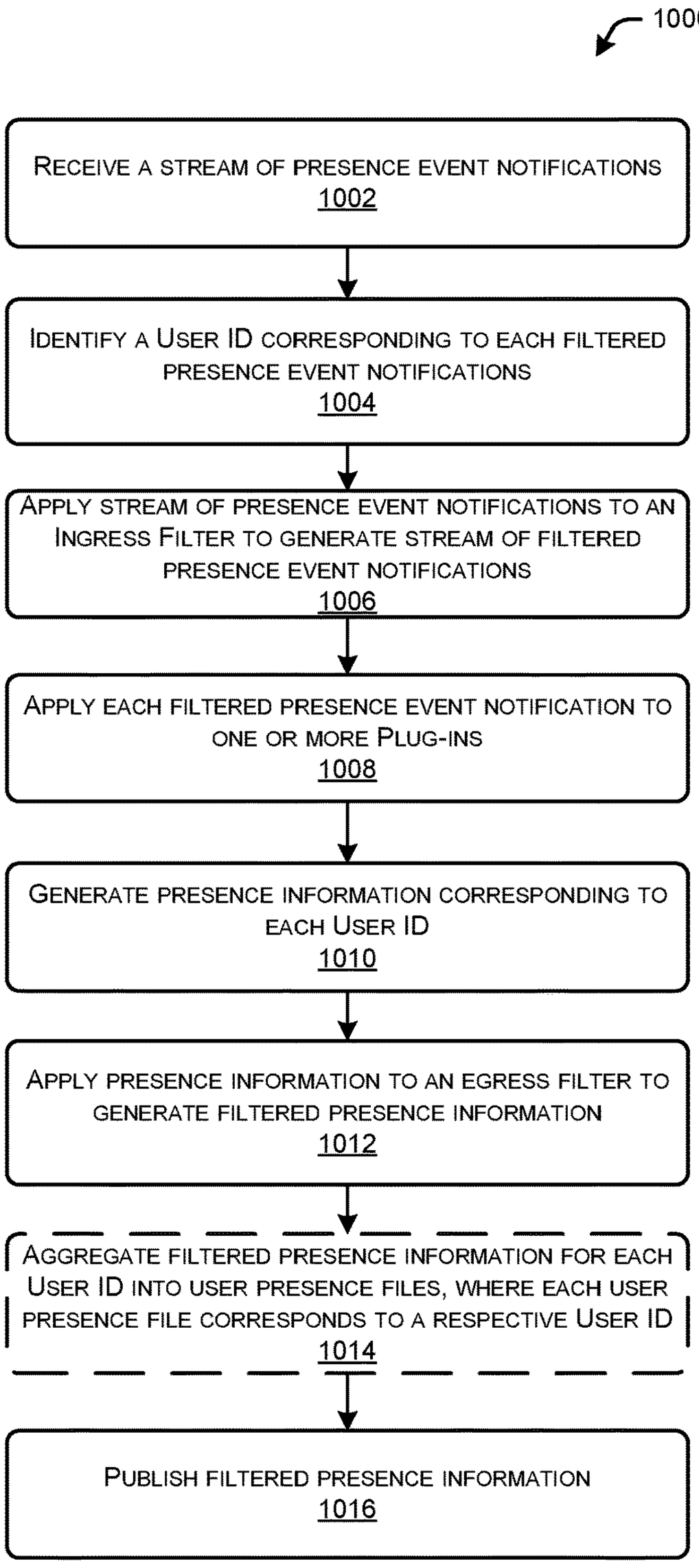
1000
RECEIVE A STREAM OF PRESENCE EVENT NOTIFICATIONS
1002
IDENTIFY A USER ID CORRESPONDING TO EACH FILTERED PRESENCE EVENT NOTIFICATIONS
1004
APPLY STREAM OF PRESENCE EVENT NOTIFICATIONS TO AN INGRESS FILTER TO GENERATE STREAM OF FILTERED PRESENCE EVENT NOTIFICATIONS
1006
APPLY EACH FILTERED PRESENCE EVENT NOTIFICATION TO ONE OR MORE PLUG-INS
1008
GENERATE PRESENCE INFORMATION CORRESPONDING TO EACH USER ID
1010
APPLY PRESENCE INFORMATION TO AN EGRESS FILTER TO GENERATE FILTERED PRESENCE INFORMATION
1012
AGGREGATE FILTERED PRESENCE INFORMATION FOR EACH USER ID INTO USER PRESENCE FILES, WHERE EACH USER PRESENCE FILE CORRESPONDS TO A RESPECTIVE USER ID
1014
PUBLISH FILTERED PRESENCE INFORMATION
1016

FIG. 10

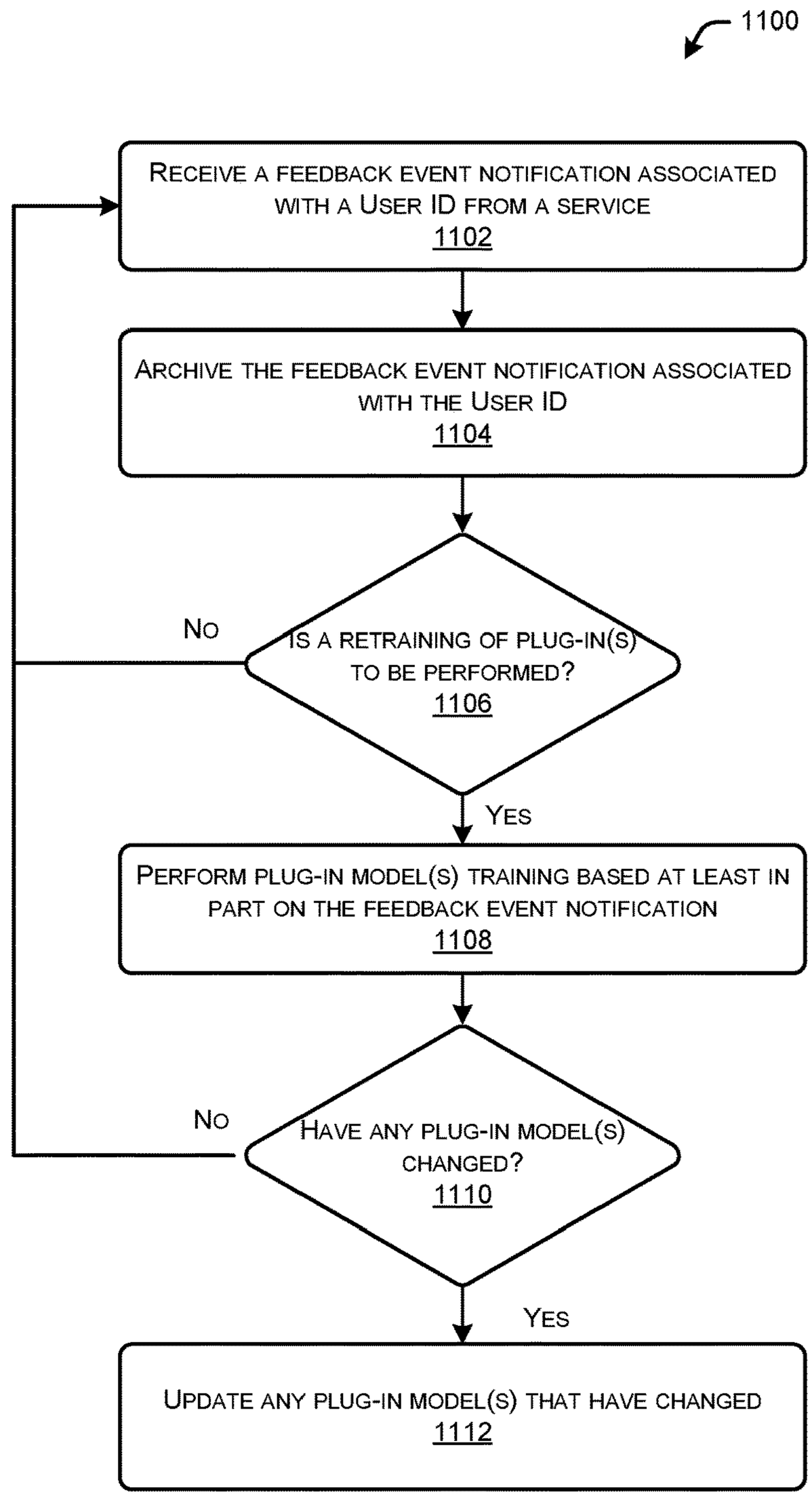
1100
RECEIVE A FEEDBACK EVENT NOTIFICATION ASSOCIATED WITH A USER ID FROM A SERVICE
1102
ARCHIVE THE FEEDBACK EVENT NOTIFICATION ASSOCIATED WITH THE USER ID
1104
IS A RETRAINING OF PLUG-IN(S) TO BE PERFORMED?
1106
NO
YES
PERFORM PLUG-IN MODEL(S) TRAINING BASED AT LEAST IN PART ON THE FEEDBACK EVENT NOTIFICATION
1108
HAVE ANY PLUG-IN MODEL(S) CHANGED?
1110
NO
YES
UPDATE ANY PLUG-IN MODEL(S) THAT HAVE CHANGED
1112

FIG. 11

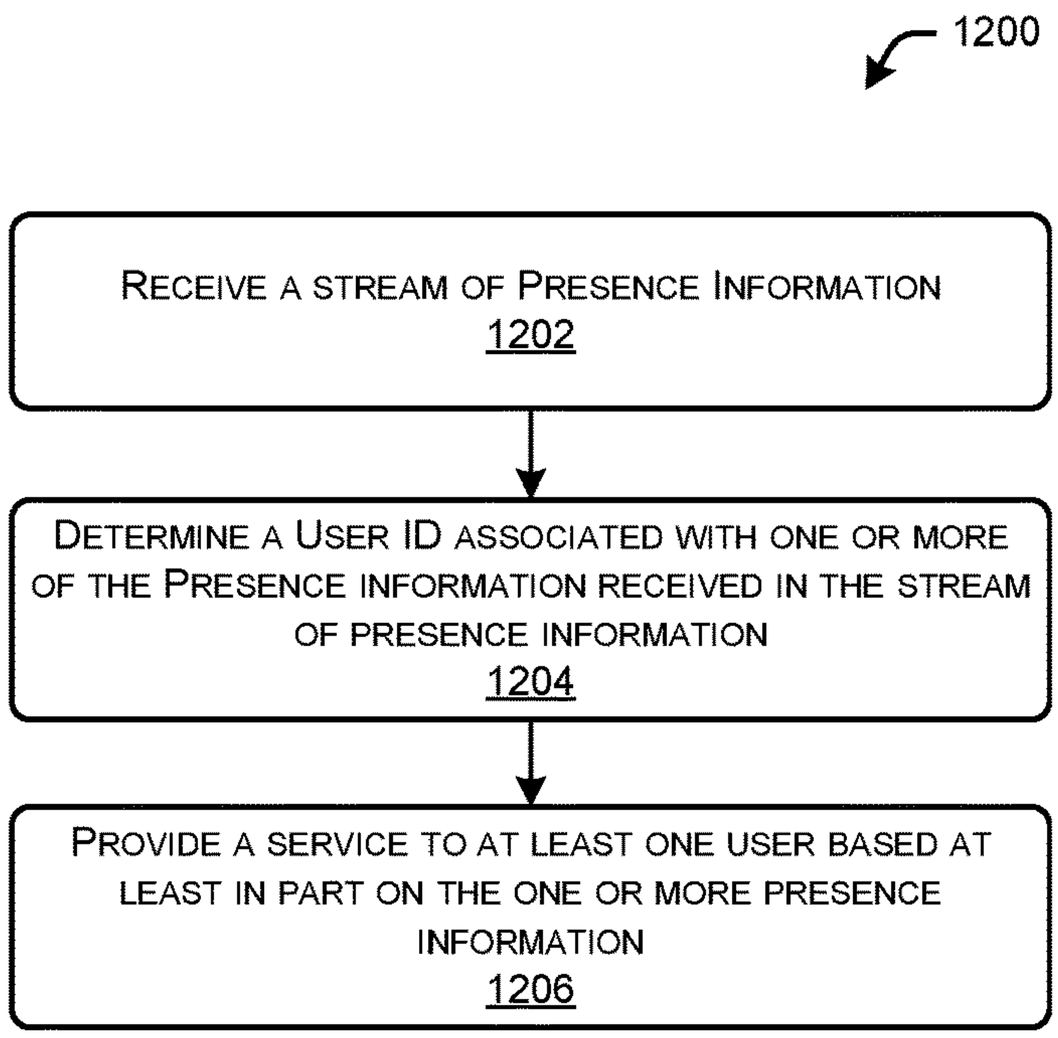
1200
RECEIVE A STREAM OF PRESENCE INFORMATION
1202
DETERMINE A USER ID ASSOCIATED WITH ONE OR MORE OF THE PRESENCE INFORMATION RECEIVED IN THE STREAM OF PRESENCE INFORMATION
1204
PROVIDE A SERVICE TO AT LEAST ONE USER BASED AT LEAST IN PART ON THE ONE OR MORE PRESENCE INFORMATION
1206

FIG. 12

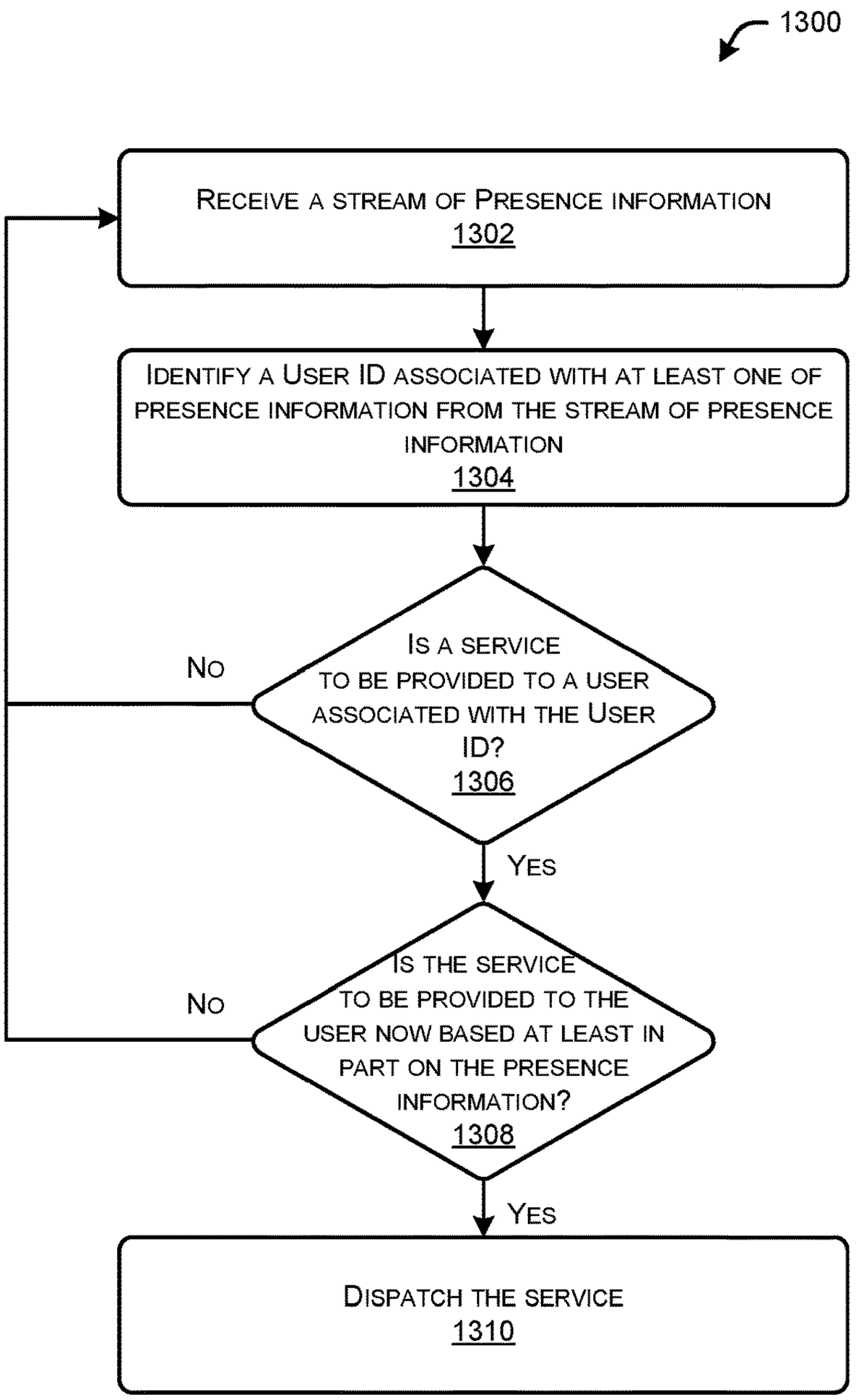
1300
RECEIVE A STREAM OF PRESENCE INFORMATION
1302
IDENTIFY A USER ID ASSOCIATED WITH AT LEAST ONE OF PRESENCE INFORMATION FROM THE STREAM OF PRESENCE INFORMATION
1304
IS A SERVICE TO BE PROVIDED TO A USER ASSOCIATED WITH THE USER ID?
1306
NO
YES
IS THE SERVICE TO BE PROVIDED TO THE USER NOW BASED AT LEAST IN PART ON THE PRESENCE INFORMATION?
1308
NO
YES
DISPATCH THE SERVICE
1310

FIG. 13

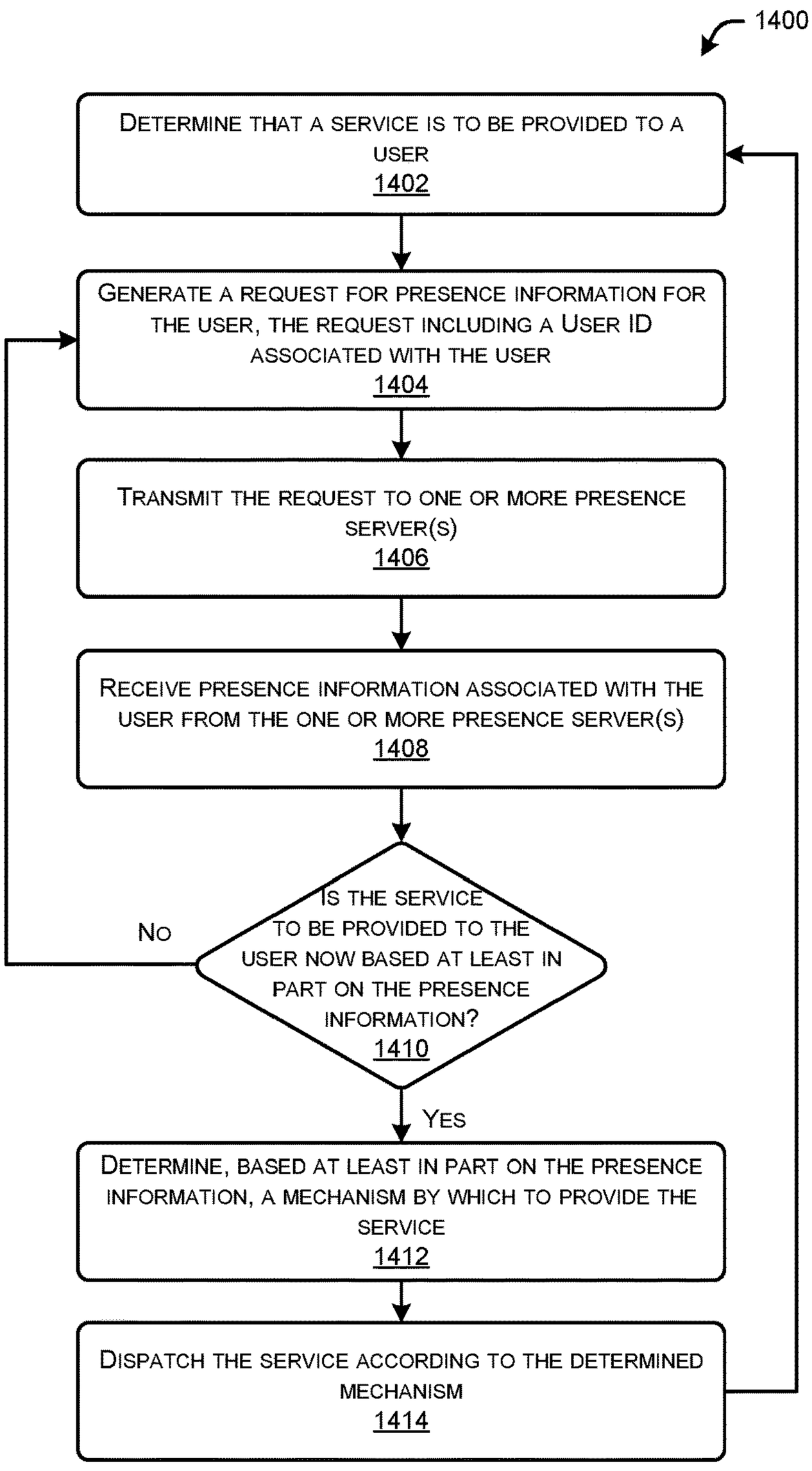
1400
DETERMINE THAT A SERVICE IS TO BE PROVIDED TO A USER
1402
GENERATE A REQUEST FOR PRESENCE INFORMATION FOR THE USER, THE REQUEST INCLUDING A USER ID ASSOCIATED WITH THE USER
1404
TRANSMIT THE REQUEST TO ONE OR MORE PRESENCE SERVER(S)
1406
RECEIVE PRESENCE INFORMATION ASSOCIATED WITH THE USER FROM THE ONE OR MORE PRESENCE SERVER(S)
1408
IS THE SERVICE TO BE PROVIDED TO THE USER NOW BASED AT LEAST IN PART ON THE PRESENCE INFORMATION?
1410
NO
YES
DETERMINE, BASED AT LEAST IN PART ON THE PRESENCE INFORMATION, A MECHANISM BY WHICH TO PROVIDE THE SERVICE
1412
DISPATCH THE SERVICE ACCORDING TO THE DETERMINED MECHANISM
1414

FIG. 14

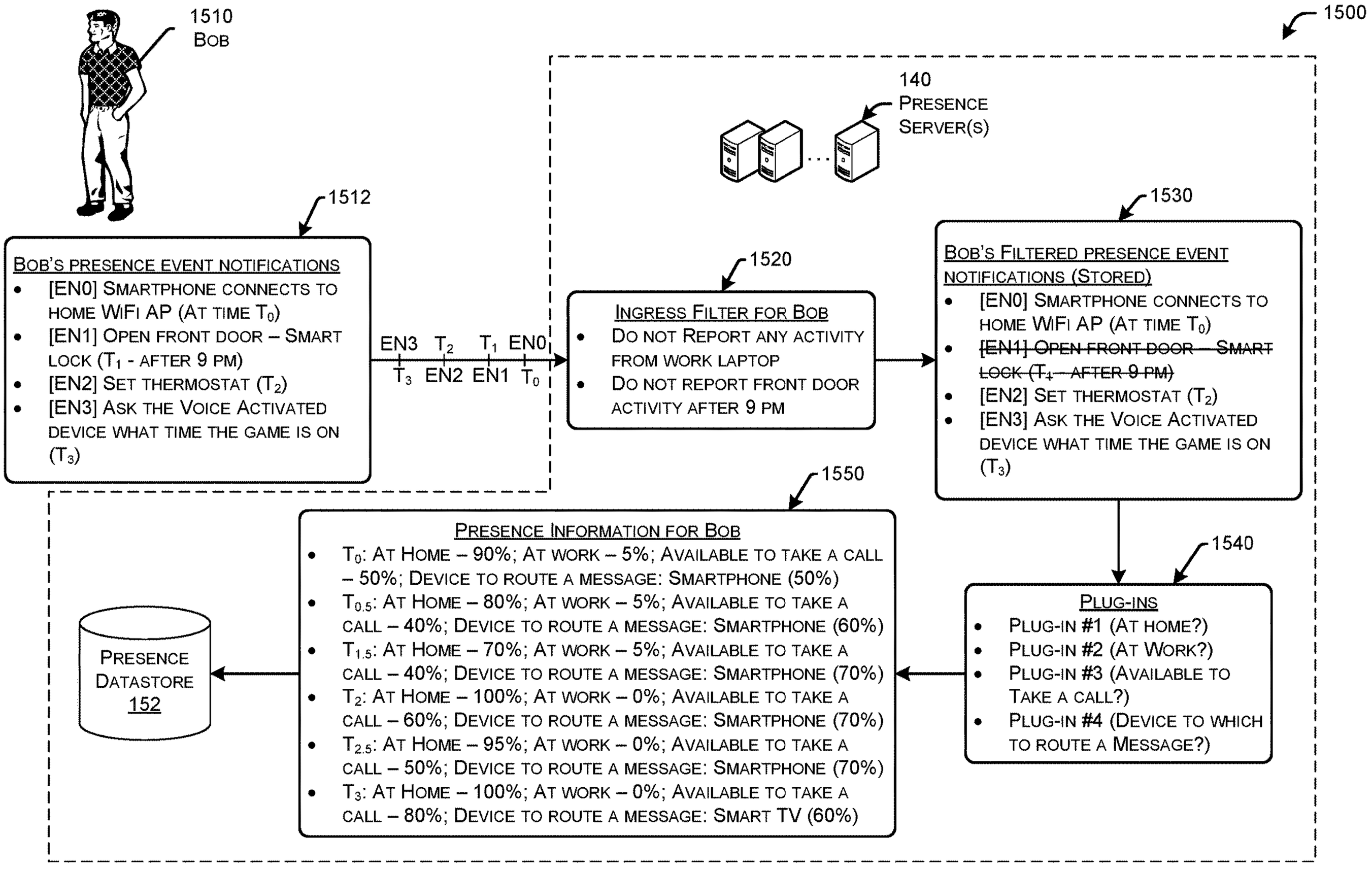
1510
BOB
1500
140
PRESENCE SERVER(S)
1512
BOB'S PRESENCE EVENT NOTIFICATIONS
• [EN0] SMARTPHONE CONNECTS TO HOME WIFI AP (AT TIME T_0)
• [EN1] OPEN FRONT DOOR – SMART LOCK (T_1 - AFTER 9 PM)
• [EN2] SET THERMOSTAT (T_2)
• [EN3] ASK THE VOICE ACTIVATED DEVICE WHAT TIME THE GAME IS ON (T_3)
EN3 T_2 T_1 EN0
T_3 EN2 EN1 T_0
1520
INGRESS FILTER FOR BOB
• DO NOT REPORT ANY ACTIVITY FROM WORK LAPTOP
• DO NOT REPORT FRONT DOOR ACTIVITY AFTER 9 PM
1530
BOB'S FILTERED PRESENCE EVENT NOTIFICATIONS (STORED)
• [EN0] SMARTPHONE CONNECTS TO HOME WIFI AP (AT TIME T_0)
• ~~[EN1] OPEN FRONT DOOR – SMART LOCK (T_1 – AFTER 9 PM)~~
• [EN2] SET THERMOSTAT (T_2)
• [EN3] ASK THE VOICE ACTIVATED DEVICE WHAT TIME THE GAME IS ON (T_3)
1550
PRESENCE INFORMATION FOR BOB
• T_0: AT HOME – 90%; AT WORK – 5%; AVAILABLE TO TAKE A CALL – 50%; DEVICE TO ROUTE A MESSAGE: SMARTPHONE (50%)
• $T_{0.5}$: AT HOME – 80%; AT WORK – 5%; AVAILABLE TO TAKE A CALL – 40%; DEVICE TO ROUTE A MESSAGE: SMARTPHONE (60%)
• $T_{1.5}$: AT HOME – 70%; AT WORK – 5%; AVAILABLE TO TAKE A CALL – 40%; DEVICE TO ROUTE A MESSAGE: SMARTPHONE (70%)
• T_2: AT HOME – 100%; AT WORK – 0%; AVAILABLE TO TAKE A CALL – 60%; DEVICE TO ROUTE A MESSAGE: SMARTPHONE (70%)
• $T_{2.5}$: AT HOME – 95%; AT WORK – 0%; AVAILABLE TO TAKE A CALL – 50%; DEVICE TO ROUTE A MESSAGE: SMARTPHONE (70%)
• T_3: AT HOME – 100%; AT WORK – 0%; AVAILABLE TO TAKE A CALL – 80%; DEVICE TO ROUTE A MESSAGE: SMART TV (60%)
1540
PLUG-INS
• PLUG-IN #1 (AT HOME?)
• PLUG-IN #2 (AT WORK?)
• PLUG-IN #3 (AVAILABLE TO TAKE A CALL?)
• PLUG-IN #4 (DEVICE TO WHICH TO ROUTE A MESSAGE?)
PRESENCE DATASTORE 152

FIG. 15

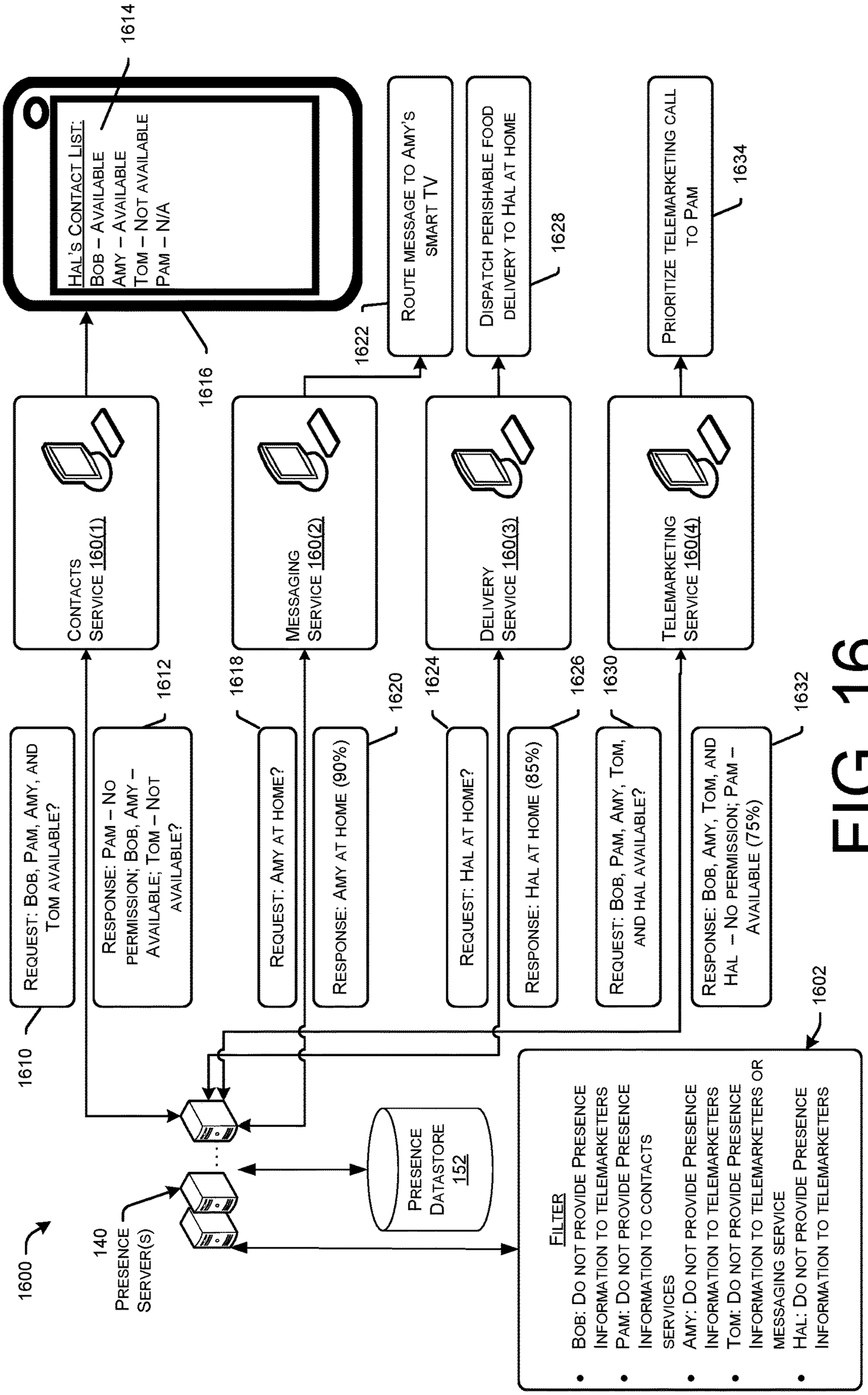
1614
HAL'S CONTACT LIST:
BOB – AVAILABLE
AMY – AVAILABLE
TOM – NOT AVAILABLE
PAM – N/A
1616
1622
ROUTE MESSAGE TO AMY'S SMART TV
DISPATCH PERISHABLE FOOD DELIVERY TO HAL AT HOME
1628
PRIORITIZE TELEMARKETING CALL TO PAM
1634
CONTACTS SERVICE 160(1)
MESSAGING SERVICE 160(2)
DELIVERY SERVICE 160(3)
TELEMARKETING SERVICE 160(4)
REQUEST: BOB, PAM, AMY, AND TOM AVAILABLE?
1610
RESPONSE: PAM – NO PERMISSION; BOB, AMY – AVAILABLE; TOM – NOT AVAILABLE?
1612
REQUEST: AMY AT HOME?
1618
RESPONSE: AMY AT HOME (90%)
1620
REQUEST: HAL AT HOME?
1624
RESPONSE: HAL AT HOME (85%)
1626
REQUEST: BOB, PAM, AMY, TOM, AND HAL AVAILABLE?
1630
RESPONSE: BOB, AMY, TOM, AND HAL – NO PERMISSION; PAM – AVAILABLE (75%)
1632
1602
1600
140 PRESENCE SERVER(S)
PRESENCE DATASTORE 152
FILTER
BOB: DO NOT PROVIDE PRESENCE INFORMATION TO TELEMARKETERS
PAM: DO NOT PROVIDE PRESENCE INFORMATION TO CONTACTS SERVICES
AMY: DO NOT PROVIDE PRESENCE INFORMATION TO TELEMARKETERS
TOM: DO NOT PROVIDE PRESENCE INFORMATION TO TELEMARKETERS OR MESSAGING SERVICE
HAL: DO NOT PROVIDE PRESENCE INFORMATION TO TELEMARKETERS

FIG. 16

CONTEXTUAL PRESENCE

RELATED APPLICATIONS

This application claims priority to and is a continuation of U.S. patent application Ser. No. 15/395,816, filed on Dec. 30, 2016, the entire contents of which are incorporated herein by reference.

BACKGROUND

Service providers are increasingly offering new and different services to customers. In some instances, these service providers provide these services when users are present and/or available to receive such services. In some cases, the service providers may be unable to provide services to customers who are not present and/or available to accept such services.

BRIEF DESCRIPTION OF THE DRAWINGS

The detailed description is described with reference to the accompanying figures. In the figures, the left-most digit(s) of a reference number identifies the figure in which the reference number first appears. The same reference numbers in different figures indicate similar or identical items.

FIG. **1** illustrates a schematic diagram of an example environment with a variety of user devices that provide presence-event notifications to one or more presence server(s), which, in turn, provide presence information to one or more service(s).

FIG. **2** illustrates a schematic diagram of more than one example locations at which a user may be located, and the presence events that may be reported from these locations associated with the user.

FIG. **3** illustrates a block diagram of an example architecture of a user device that reports a presence event to one or more presence server(s).

FIG. **4** illustrates a block diagram of an example of one or more presence server(s) that receive presence-event notification(s) and provide presence information.

FIG. **5** illustrates a block diagram of an example service provider device that receives presence information and is configured to dispatch one or more service(s).

FIG. **6** illustrates a flow diagram of an example method for providing presence-event notifications to a presence server.

FIG. **7** illustrates a flow diagram of an example method for receiving a presence-event notification and providing presence information.

FIG. **8** illustrates a flow diagram of an example method for generating a revised probability of a user being present at a particular location.

FIG. **9** illustrates a flow diagram of an example method for receiving a request for presence information and fulfilling the request.

FIG. **10** illustrates a flow diagram of an example method of receiving a stream of presence-event notifications, generating presence information from the stream, and publishing the presence information.

FIG. **11** illustrates a flow diagram of an example method of receiving feedback event notification(s) and revising plug-in models based on the received feedback event notification.

FIG. **12** illustrates a flow diagram of an example method for receiving presence information and dispatching a service based at least in part on the presence information.

FIG. **13** illustrates a flow diagram of an example method for receiving a stream of presence information and determining if a service is to be dispatched based at least in part on the stream of presence information.

FIG. **14** illustrates a flow diagram of an example method for generating and transmitting a request for presence information, and dispatching a service based on received presence information.

FIG. **15** illustrates a schematic diagram of an example environment where presence-event notifications are generated for a user, filtered, and then used to generate presence information.

FIG. **16** illustrates a schematic diagram of an example environment where presence information is requested by a variety of services and used to provide services.

DETAILED DESCRIPTION

Example embodiments of this disclosure describe methods, apparatuses, computer-readable media, and systems for receiving notifications of presence events from one or more user device(s) associated with a user or a group of users. The presence events may be any type of event that gives an indication that a particular user may be in a particular predefined location (e.g., home, office, car, etc.) and/or are available to receive a service. The collection of any presence-based information may occur with explicit consent of each user, such as in response to each user affirmatively requesting to participate in a presence-based service.

Presence events may be generated by any variety of user device(s) that may interact with a particular user or group of user(s). Such presence event(s) may be generated based at least in part on an interaction between the user and a user device, or an interaction between two or more user devices. In some example embodiments, interaction event data representative of an event may be generated by a user device based on a user interacting with his/her user device. For example, if a user speaks a wake word and/or asks a question to his/her voice-controlled device that is known to be associated with a particular location, then the voice-controlled device may register an interaction event that is indicative of the user's location at a particular place (e.g., home, office, car, etc.) where the user device that registered the interaction event is located. As another example, if a person's smartphone connects with a particular Wi-Fi access point (AP), then a presence event may be generated by the smartphone and/or the AP. As yet another example, if a smart lock on a door to a person's house is activated (e.g., unlocked), then the unlocking action may be used as the basis for generating presence event data. Further example user device(s) and/or activities that may cause the generation of presence event(s) include interactions with: smart appliances (e.g., opening/closing a refrigerator door or stove door), a desktop or laptop computer, global satellite navigation system (e.g., global positioning satellite (GPS) system), smart motion sensors, home monitoring and other types of cameras, and/or smart thermostats. Additionally, any variety of biometric mechanisms may be employed for generating presence events, such as facial recognition, automatic speech recognition (ASR), fingerprint recognition, or any other type of biometric identification. Indeed, any suitable action or function associated with a user and performed by a user device may generate presence-event notification data. Such actions may be active interactions with a user, passive detection of the user, and/or pre-programmed actions or functions performed with one or more other user

devices. The device(s) and/or mechanisms discussed here are by example only, and are not intended to be limiting or exhaustive in nature.

Once a user device generates a presence event, it may send an indication of the presence event, or a presence-event notification, to one or more presence server(s). The presence server(s) may receive presence-event notification(s) generated by not only user devices associated with a particular user and/or a group of users, but also from a plurality of other user device(s) and/or group of user device(s). In some cases, the presence-event notifications may be tagged (e.g., metadata, message attachments, etc.) with a user identification associated with one or more users (e.g., an individual, a family, a household, any combination of roommates, etc.). In other cases, the presence-event notifications may not be tagged with a user identification, but may instead be tagged with a reporting user device that may be associated with a particular user identification, group of user identifications, a user, and/or a group of users. In some cases, a particular user device may be associated with more than one user and/or user identifications. For example, a smart microwave oven that may detect, generate, and transmit a presence-event notification upon user interaction (e.g., opening/closing the microwave oven door), may report such an interaction event as an interaction event notification associated with a husband's user identification, a wife's user identification, and/or any number of children's user identifications, within a household. Alternatively, or in addition, the whole family may have a single user identification that may be tagged to any presence-event notifications produced by the smart microwave oven. In embodiments where a user identification may not be provided with presence-event notification(s) a user and/or user identification may be identified by the recipient of the presence-event notification(s) based on a variety of other information, such as a user device that transmits such a presence event.

In example embodiments, in addition to a presence event notification including information pertaining to an identification(s) of a user, a group of users, and/or user device(s), there may be any number of additional suitable information. For example, such information may include indications of what kind of activity the user may be engaged in with the user device that detects the presence event. For example, if a user is watching a particular movie on a smart TV, the smart TV may include the title of the movie that that is being watched by the user and/or group of users. This type of presence event notifications may not only be used to derive information such as presence at a particular location and/or availability, but also a propensity of a user or a group of users to engage in a particular activity. For example, if a user is watching a particular movie, that user may be more likely to purchase a soundtrack of that movie than someone who never watched it.

In some example embodiments, a remote server may generate presence event notifications associated with a particular user. For example, a user logging into a social media account, an email account, or indeed any type of login and/or user identifying event may be used by a service and/or remote server to generate a presence event notification. As another example, when a particular website is accessed from a particular user device, the website may be configured to identify the user device and generate a presence event notification that indicates the user device has accessed the website, along with any other suitable information (e.g., user identification, user activity, etc.).

The presence-event notifications may be transmitted by user devices to one or more presence server(s) via one or more networks (e.g., the Internet, etc.). When the presence server(s) receive a stream of presence-event notifications from a number of different user device(s) associated with a number of different users, the presence server(s) may partition the presence events into individual presence-event notifications and ascribe a user identification to each of the presence events. In some cases, the presence events may be tagged with a user identification. In other cases, the presence server(s) may associate a user identification to a received presence event based at least in part on a signature or identification of a user device from which the presence event is received. In other words, the presence server(s), in some example embodiments, may have a mapping (e.g., a look-up table, etc.) for associating an incoming presence event to a particular user and/or user identification.

The presence events received by the presence server(s) may be applied to an ingress filter. The ingress filter may define a number of ingress filter parameters by which to filter the incoming stream of presence-event notifications, and discard some of the incoming presence-event notifications according to one or more criteria that are encoded in the ingress filter parameters. Presence-event notifications may be filtered by any variety of criteria, such as the type of the presence event, the users to which they pertain, the age of the users, the geography of the user, user-defined criteria, combinations thereof, or the like. In some example embodiments, the ingress filter parameters may be universal across some or all users for whom presence-event notifications are received. In other example embodiments, the ingress filter parameters may be specific to each user or group of users. In other words, according to some example embodiments, individual users may have different criteria by which their presence-event notifications are filtered. In yet further example embodiments, the one or more filtering criteria for the ingress filter parameters may be user-selectable. Thus, in these example embodiments, the user may be able to select which types of presence events, as reported by his/her user device(s) to the one or more presence server(s), are to be discarded. For example, a user may instruct, as parametrized in the ingress filter parameters, that any of his/her work-related user devices providing presence-event notifications during work hours are not to be used to determine, report, and/or track the user's location and/or availability. In this case, suppose the user's work laptop computer triggers and provides a presence-event notification based upon the user logging into the work laptop computer during work hours, then this presence-event notification may be filtered out by the ingress filter at the presence server(s) and may not be used for generating any type of presence information about the user at the presence server(s).

In some example embodiments, incoming presence-event notifications that have not been filtered out by the ingress filtering process may be stored in any suitable presence-event archive, such as a presence-event notification datastore. The filtered presence-event notifications may be archived permanently or for any predetermined period of time.

If the presence server(s) receive a presence-event notification that has not been filtered out by the ingress filtering, the presence server(s) may ascribe a user to the notification, such as by identifying an associated user identification, user account, and/or user profile associated with the received presence-event notification. According to example embodiments, the presence server(s) may apply the presence event notification to one or more presence plug-ins. The presence plug-ins may have one or more presence models that generate presence information. The presence information may

provide any suitable variety of indications, such as if a user or a group of users are in a particular location, if a user or a group of users are available to receive a service, and/or a likelihood that a user or group of users are to engage in an activity. For example, presence information may indicate if a particular user is in his/her home to accept a physical delivery. As another example, the presence information may be indicative of a person's availability to accept a call or receive a message on his/her user device. As yet another example, the presence information may be indicative of a person's propensity to engage in an activity, such as purchase a service or product, or view an advertisement. As a non-limiting example, consider a previous example where a presence-event notification indicated that a user is watching a particular movie. When this presence-event notification is applied to a presence plug-in, the presence plug-in may generate presence information that indicates that the user has a 60% likelihood of purchasing a soundtrack of the particular movie.

These presence models, in some example embodiments, may provide a binary indication of whether a user associated with the presence event is at a particular location, is available for receiving a service, and/or is likely to engage in a particular activity. Thus, in these example embodiments, the presence models may indicate a yes or no, or possibly unknown, answer to the question of whether the user is present at a particular location, is available, and/or will engage in an activity. In other example embodiments, the presence models of the plug-ins may generate presence information that includes a probability and/or a confidence level of the user being at a particular location, being available, and/or engaging in an activity. For example, the plug-in may report that the probability of the user being at his/her home is 85%. As a result, a consumer of the presence information, such as a service provider, may be able to use the probability, such as by comparing the probability to a threshold level, to determine if they wish to dispatch a service. As another example, another plug-in may report that the probability of the user visiting a particular amusement park may be 40%. The operators of the amusement park may use this information to determine if they wish to advertise to this user and/or provide incentives and/or coupons to the user to increase his/her probability of visiting the amusement park.

The presence model(s) may be any suitable types of predictive model(s), probabilistic distribution(s), statistical model(s), analytical equation(s), linear or non-linear mapping(s), or indeed any type of predictive mechanism(s) that may relate an incoming presence-event notification, or a group of presence-event notifications, to a prediction of the user's and/or group of users' presence at a particular location, availability, and/or propensity to engage in an activity (e.g., purchase, subscribe, view, visit, call, etc.). Such models may include, for example, direct mapping, machine learning models, regression models, neural network models, any variety of statistical models, combinations thereof, or the like. The presence models, as embodied in the plug-ins may take into account various confidence levels of user detection associated with different types of presence events. For example, a user interaction where the user speaks a wake word to his/her home voice-controlled device may result in a relatively high confidence level of the user being at home. A presence model, as embodied in one or more plug-ins may use this presence-event notification to ascribe, for example, a confidence of 100% that the user is at home. On the other hand, tripping a motion sensor at the user's home, particularly if the owner has a pet that can trip the motion sensor, may generate a presence-event notification that may be considered a less reliable indicator of the user being at home than the presence-event notification associated with the voice-controlled device. In this case, a presence model, as embodied in one or more plug-ins may use this presence-event notification from the motion sensor to ascribe, for example, a confidence of 30% that the user is at home. In example embodiments, the plug-ins may be configured to utilize more than one presence-event notification to predict the presence of a user at a particular location and/or being available for a service. For example, if a user device that is normally, but not always, carried by the user is connected to the user home Wi-Fi, then that may generate a confidence level, by itself, of 75% that the user is at home. However, if that presence-event notification is considered by the plug-ins in addition to the prior example presence-event notification from the motion detector, then the plug-ins and the presence models embodied therein may determine a higher probability, such as 95%, that the user is at home.

In example embodiments, the presence model(s) may consider more than one presence-event notification associated with a particular user and/or group of users to generate presence information. For example, the presence model(s) may access the datastore of post-ingress filtered presence-event notifications associated with a particular user or group of users to generate one or more presence information. In fact, different presence models may use different numbers and/or different types of presence-event notifications to generate presence information. The presence model(s) may consider contextual information (e.g., what is the user doing, what is the user asking for, what is the user listening to, what is the user reading, etc.), as provided in example presence event notifications, to generate presence information.

In some example embodiments, the presence model(s) and/or the presence plug-in(s) within which the presence model(s) are embodied, may themselves generate presence-event notifications and/or other notifications that may be consumed by other plug-ins to generate presence information. As an example, a first plug-in may generate information about a particular user that may be used by a second and a third plug-in to generate presence information about that user. As another example, a first plug-in may determine that a particular user is in proximity to his/her smartphone on which he/she typically purchases music. A second plug-in may determine that the particular user is listening to a particular artist's music on another of the user's user devices. A third plug-in may be able to take the information generated by both the first plug-in and the second plug-in to generate presence information that may indicate a probability of the user purchasing a new music track released by the particular artist. A particular presence model and/or presence plug-in may use any suitable number and/or combination of presence-event notifications from user devices (e.g., indicating user interaction with the user devices and/or between user devices, etc.), from other service servers (e.g., indicating user login to a social network site or service provider site, user making a purchase on retail website, etc.), and/or from other plug-ins, as described above.

When the presence server(s) generate presence information, the presence server(s), in example embodiments, may tag the presence information with some type of identifier (e.g., a user identification, login, etc.) of the user to which that presence information pertains. Thus, the presence information may include a binary indicator (e.g., available or not available), a probabilistic indicator, and/or an indicator of the user to which the presence information pertains. The presence server(s), in example embodiments, may stream

out the presence information to a variety of service provider that are authorized to receive that presence information via a corresponding service provider system. Alternatively, or additionally, the presence server(s) may store the presence information, associated with the user (e.g., by user identification), in a presence datastore. The presence datastore, in some example embodiments, may be accessible to retrieve, such as by using a reference to a corresponding user identification, presence information pertaining to a user. Such a retrieval may be performed, in example embodiments, responsive to a request for presence information, such as from a service provider.

In some example embodiments, if the presence server(s) generate more than one presence information pertaining to a particular user, those presence information elements may be aggregated into a single file and/or document before publishing (e.g., streaming and/or storing in the presence datastore). More than one presence information may be generated if a single or multiple filtered presence-event notification(s) result in the generation of multiple presence information, such as from a single plug-in or from different plug-ins. For example, if a particular plug-in determines, based at least in part on a presence-event notification, that there is a 100% probability of the user being at home, another plug-in may determine, such as based in part on the same presence-event notification, that the user has a 0% probability of being in his/her office. Yet another plug-in, based at least in part on the same presence-event notification, may determine that there is a 5% probability of the user being in his/her car. In other example embodiments, multiple presence information may be generated for a particular user based at least in part on the multiple presence-event notifications, as received by the presence server(s).

In some example embodiments, an egress filter may be implemented to filter presence information, as generated by the presence server(s). Similar to the ingress filter, the egress filter, in example embodiments, may have filtering parameters based on criteria that may be universal, tailored to an individual user, and/or based at least in part on the service provider that may have access to the presence information. For example, a user may request that presence information for him/her not be made available between 11 AM and 6 AM the next day, when he/she anticipates being asleep. This criterion may be encoded in egress filter parameters to prevent the presence server(s) from providing presence information pertaining to this user during the hours indicated by the user.

The level of confidence of presence-event notifications in predicting presence information may decay over time. For example, a presence event that occurred 2 minutes ago may provide a high level of confidence that a particular user is in a particular location. However, that same presence event, may provide a much lower level of confidence if 2 hours of time has passed since the presence event occurred. Therefore, in example embodiments of the disclosure, the presence server(s) may implement a time decay function for presence events that are used for generating presence information that is published (e.g., streamed or stored in the presence datastore). In some example embodiments, the time decay function may decrement a weight of a presence-event notification in providing predictive value within a presence model. For example, a time decay function may be used to diminish the weight and/or predictive value of a received presence-event notification over time within a presence model that uses that presence-event notification. The time decay function may provide a schedule for decreasing the weight of a particular presence-event notification within a presence model. In example embodiments, the time decay function may define a curve (e.g., weight vs. time, etc.) definition, according to which the weight of a particular presence-event notification is to be decayed. In example embodiments, different presence event notifications may be decayed according to different decay functions. The decay functions may continue to perform a decrement in the weight and/or confidence of a presence event in a periodic, or non-periodic, linear, or non-linear fashion, until the weight becomes meaningless, reaches a confidence of 0%, and/or is reset by the receipt of a new presence-event notification of the same and/or similar type associated with the user. As newly revised probability for a user being at a particular location, being available, or engaging in an action is generated, the new probability may be published in a similar fashion as the initial presence information, such as by streaming the new presence information and/or storing the new presence information in the presence datastore.

In alternate example embodiments, the time decay function may decrement a probability of a person being at a particular location, available, and/or his/her propensity to engage in an action over time elapsed from when the presence information was generated. In example embodiments, the time decay function may decrement a probability provided in presence information by a predetermined amount, and after a predetermined time period. It may continue to perform this decrement in a periodic, or non-periodic, linear, or non-linear fashion, until the probability becomes meaningless, reaches a probability of 0%, and/or is reset by the receipt of a new presence-event notification associated with the user. As a newly revised probability for a user being at a particular location, or being available, is generated, the new probability may be published in a similar fashion as the initial presence information, such as by streaming the new presence information and/or storing the new presence information in the presence datastore.

As an example of the time decay function, consider that a person's smartphone connecting to his/her home Wi-Fi is reported as a presence event to the presence server(s), resulting in a 90% initial probability that the user is at home. After 10 minutes the probability may be revised to 85%, and then after another 10 minutes 70%, and then after another 10 minutes 40%, and so on and so forth. In example embodiments, if a new presence information is determined based at least in part on new presence-event notifications, then the presence server(s) may not issue revised probabilities using its time decay functions.

In some example embodiments, the presence servers, instead of publishing updated time decayed presence information, may provide parameters that may allow a consumer of the presence information (e.g., a service provider) to decay the presence information itself. As an example, a function may be provided, along with the presence information, that may be used by a service provider to time decay any probability and/or confidence level according to the function. As another example, a piecewise curve may be provided that to the service provider that indicates a duration and change in the probability and/or confidence level with elapsed time.

The presence information, as generated by the presence server(s), may be available to one or more service providers via their service provider system(s). The service providers, if authorized to do so, may access and/or request the presence information via any suitable service provider system, such as a desktop computer, server, laptop computer, smartphone, or the like. In some example embodiments, the service provider(s) may receive a stream of presence infor-

mation, as output by the presence server(s). A service provider may monitor the presence information stream to determine if it recognizes any of the user identifications associated with any of the presence information in the stream of presence information. If the service provider finds a presence information for which it is able to identify the corresponding user, such as by his/her user identification, then the service provider may determine if it is to provide any services to that user. If it is not to provide any services to the user, then the service provider may discard the presence information. However, if the service provider is to provide a service to that user, then it may use the presence information, as identified by it as pertaining to the user, to determine if the service is to be provided and/or provided at this time. For example, if the service provider is to deliver perishable goods to a user, and it is necessary for the user to be home to ensure that the deliveries do not perish, then the service provider may dispatch the delivery if it is sufficiently confident, based at least in part on the presence information, that the user is at home.

In some example embodiments, instead of, or in addition to, monitoring a stream of presence information, a service provider may request presence information associated with a particular user to whom services are to be provided. The service provider may generate a request that indicates the user, such as by user identification, for whom presence information is requested. The request may be sent, such as via one or more networks (e.g., the Internet) and/or via a query application program interface (API), to the presence server(s). The presence server(s) may determine, responsive to receiving the request, whether the requesting service provider is authorized to receive the requested presence information. The requested presence information may be provided to the service if the service is indeed authorized to receive the requested presence information. If the service provider is not allowed to receive the requested presence information, then the service provider may be notified, by the presence server(s), that it lacks the authority to receive the requested presence information. As an example, if a particular user specifies that he/she does not want his/her presence information shared with debt collection agencies, then if a debt collection agency attempts to obtain his/her presence information, the presence server(s) may not share the requested presence information with the debt collection service.

Certain implementations and embodiments of the disclosure will now be described more fully below with reference to the accompanying figures, in which various aspects are shown. However, the various aspects may be implemented in many different forms and should not be construed as limited to the implementations set forth herein. The disclosure encompasses variations of the embodiments, as described herein. Like numbers refer to like elements throughout.

FIG. **1** illustrates a schematic diagram of an example environment **100** with a variety of user devices **122**(**1**), **122**(**2**), **122**(**3**), **122**(**4**), **122**(**5**), **122**(**6**), **122**(**7**) that provide presence-event notifications to one or more presence server(s) **140**, that, in turn, provide presence information to one or more service(s) **160**(**1**), **160**(**2**), **160**(**3**), . . . **160**(N), in accordance with example embodiments of the disclosure.

The example environment **100** may include a location **110**, such as a home, work, car, conference room, coffee shop, or any other type of location **110** where a user **120** may be present. The location may have a variety of user devices **122**(**1**), **122**(**2**), **122**(**3**), **122**(**4**), **122**(**5**), **122**(**6**), **122**(**7**) (hereinafter referred to individually or collectively as user device **122**) that may interact with each other, or with which the user **120** may interact. These interactions, in some example embodiments, may be deemed potential presence events by one or more of the user devices **122**. The user devices **122**, upon determining an interaction to be a presence event may generate a presence-event notification and send the presence-event notification via one or more networks **130** to presence server(s) **140**.

As an example, the user **120** may speak **124** to a voice-controlled device **122**(**1**). The voice-controlled device **122**(**1**), in addition to other components, may have one or more processors, microphones, speakers, to enable automated speech recognition (ASR) and/or speech synthesis. In some example embodiments, an interaction may be initiated with the voice-controlled device **122**(**1**) by the user **120** uttering a wake word that may be recognized by the voice-controlled device **122**(**1**) to invoke the voice-controlled device **122**(**1**). Regardless of whether a wake word is needed to invoke the voice-controlled device **122**(**1**), an interaction with the user **120** may be recognized as a presence event. As a result, the voice-controlled device **122**(**1**) may generate a presence-event notification, such as an electronic file or data structure that indicates the occurrence of the presence event with the user **120**. In some example embodiments, the voice-controlled device **122**(**1**) may further be configured to recognize from the utterance **124** whether the interaction is with user **120**, or another person. The presence-event notification, as generated by the voice-controlled device **122**(**1**), may include any one or more of suitable information, such as the type of interaction (e.g., voice interaction, voice not recognized as user **120**, voice recognized as user **120**, etc.), a user identification (e.g., user identification number, name, user account identification, etc.), a reporting user device identification (e.g., user device identification number, device type—voice-controlled device, etc.), a time stamp, a geo-stamp, and/or any other suitable information. The voice-controlled device **122**(**1**), upon generating the presence-event notification, may transmit the generated presence-event notification to the presence server(s) **140** via the one or more networks **130**.

As another example, the user **120** may interact with a thermostat **122**(**2**) (e.g., a smart thermostat) that may recognize the interaction as a presence event, and in response generate a presence-event notification. The thermostat **122**(**2**) may indicate a variety of information in the presence-event notification, such as the type of interaction (e.g., thermostat setting change), a default user identification, a user device identification, timestamp, and/or any other suitable information. The thermostat **122**(**2**), upon generating the presence-event notification, may transmit the generated presence-event notification to the presence server(s) **140** via the one or more networks **130**.

As yet another example, the user **120** may interact with a set-top box (STB) **122**(**3**) (e.g., power on, change a channel, invoke a trick play, etc.) or a smart TV **122**(**5**) (e.g., power on, change a channel, launch a content streaming service, etc.) that may recognize the interaction as a presence event, and in response generate a presence-event notification(s). The STB **122**(**3**) and/or smart TV **122**(**5**) may indicate a variety of information in the presence-event notification, such as the type of interaction (e.g., turn on, etc.), a default user identification, a user device identification, timestamp, and/or any other suitable information. The STB **122**(**3**) and/or smart TV **122**(**5**), upon generating the presence-event notification, may transmit the generated presence-event notification to the presence server(s) **140** via the one or more networks **130**.

As still another example, the user **120** may trip a motion detector device **122**(**6**) that may identify the motion as a presence event, and in response may generate a presence-event notification. The motion detector device **122**(**6**) may indicate a variety of information in the presence-event notification, such as the type of interaction (e.g., motion detection, etc.), a default user identification, a user device identification, timestamp, and/or any other suitable information. The motion detector device **122**(**6**), upon generating the presence-event notification, may transmit the generated presence-event notification to the presence server(s) **140** via the one or more networks **130**.

As another example, the user **120** may carry a smartphone **122**(**7**) or other carried and/or wearable user device that, when carried within radio range of a Wi-Fi or Bluetooth access point (AP) **122**(**4**) may automatically establish a wireless connection therebetween. This action may be recognized by either or both of the smartphone **122**(**7**) and/or the AP **122**(**4**) as a presence event, and in response may generate a presence-event notification. The smartphone **122**(**7**) and/or the AP **122**(**4**) may indicate a variety of information in the presence-event notification(s), such as the type of interaction (e.g., device-to-device, communicative handshaking, etc.), a user identification, a user device identification, a geostamp, timestamp, and/or any other suitable information. The smartphone **122**(**7**) and/or the AP **122**(**4**), upon generating the presence-event notification, may transmit the generated presence-event notification to the presence server(s) **140** via the one or more networks **130**. In other example embodiments, the smartphone **122**(**7**) may be configured to generate a presence-event notification based at least in part on other information that may indicate presence and/or availability, such as GPS data, inertial sensor data, touch screen interaction information, and/or indication of voice calls and/or messaging (e.g., text messages, etc.).

Although seven different user devices **122** are depicted in FIG. **1**, in example embodiments, there may be any number or type of user devices that may be configured to detect and report presence events. User devices **122** that may be configured to detect a presence event and generate a presence-event notification may include, but is not limited to, televisions, set-top boxes, microphones, speakers, audio systems, imaging devices, computers, computing devices, servers, notebook computers, netbook computers, personal digital assistants (PDAs), smartphones, telephones, tablets, modems, routers, lights, dishwashers, washing machines, coffee machines, refrigerators, door locks, window blinds, thermostats, garage door openers, air-conditioning units, alarm systems, motion sensors, biometric sensors, pressure sensors, radio frequency sensors, ovens, microwaves, navigation systems, in-vehicle infotainment systems (IVIs), combinations thereof, or the like. Indeed, any suitable action performed by a user device may generate presence-event notification data. Such actions may be active interactions with a user, passive detection of the user, and/or pre-programmed actions performed with one or more other user devices. Additionally, in example embodiments, the presence-event notification data may include contextual information about the user and/or an activity in which the user is engaged.

The one or more networks **130** may include any viable communication technology, such as wired and/or wireless modalities and/or technologies. Networks **130** may include any combination of Personal Area Networks (PANs), Local Area Networks (LANs), Campus Area Networks (CANs), Metropolitan Area Networks (MANs), extranets, intranets, the Internet, short-range wireless communication networks (e.g., ZigBee®, Bluetooth®, etc.) Wide Area Networks (WANs)—both centralized and/or distributed—and/or any combination, permutation, and/or aggregation thereof.

The presence-event notifications, as generated by the user devices **122**, may be received, via the networks **130**, by the presence server(s) **140**. In some example embodiments, the incoming presence-event notifications may be received as a stream of presence-event notifications. The stream of presence-event notifications may be a series of presence-event notifications that are received from any variety of user devices **122** associated with any number of users **120**. In example embodiments, the presence server(s) **140** may receive presence-event notifications associated with any number of different users, and from multiple user device **122**, in an asynchronous manner (e.g., the stream). In other words, the presence server(s) **140** may receive the presence-event notifications as they are generated by the various user devices **122** that report the presence events to the presence server(s) **140**. The presence server(s) **140** may identify a user associated with each of the presence-event notification(s) that it receives. In some cases, the presence-event notifications themselves may be tagged, such as in metadata, with a user identification. In other cases, the received event notifications may be tagged with user device information that the presence server(s) **140** may be able to associate with one or more users, such as by accessing a table that maps user devices **122** to users **120**.

The presence server(s) **140** may apply the incoming presence-event notifications to an ingress filter **142** to filter out presence-event notifications that may not be allowed to be used for generating presence information. In some cases, the ingress filter parameters for filtering out presence events may be user-defined criteria. In other words, the ingress filter **142** may define a number of ingress filter parameters by which to filter the incoming stream of presence events, and discard some of the incoming presence events according to one or more criteria that are encoded in the ingress filter parameters, to generate the filtered stream **132** of presence-event notifications. Presence-event notifications may be filtered by any variety of criteria, such as the type of the presence event, the users to which they pertain, the age of the users, the geography of the user, combinations thereof, user-defined criteria, or the like. In other example embodiments, the ingress filter parameters may be the same across all users for whom presence-event notifications are received by the presence server(s) **140**. In other example embodiments, the ingress filter parameters may be specific to particular groups of users, such as users **120** in a particular geographic location, users **120** that purchase a specific service or subscription, etc. As an example, a user may instruct (e.g., parameterize in the ingress filter parameters) that his/her smartphone generated presence-event notifications during the hours of 5 PM to 10 PM may not be used for determining presence information. In this case, any presence-event notifications sent from the user's smartphone **122** to the presence server(s) **140** during the stipulated blocked times may be filtered out by the ingress filter **142**.

In some example embodiments, incoming presence-event notifications that have not been filtered out by the ingress filter **142** may be stored in any suitable presence-event archive, such as a presence-event notification datastore **146**. The filtered presence-event notifications may be archived permanently or for any predetermined period of time. In some example embodiments, different types of presence-event notifications may be stored for different predetermined times in the presence-event notification datastore **146**. Once the presence server(s) **140** receives a presence-event notifi-

cation that has not been filtered out by the ingress filter **142**, the presence server(s) **140** may apply the post-ingress filtered, and retained presence-event notification to one or more presence plug-ins **144**(**1**), **144**(**2**), . . . **144**(N) (hereinafter referred to individually or collectively as presence plug-in **144**). The presence plug-ins **144** may have one or more presence models that determine presence and/or availability information. In some example embodiments, a particular presence plug-in may determine a user's presence in a particular location, and another plug-in **144** may determine the user's availability at that location. For example, a user **120** may be at home and be on his/her phone. Based on the predictive capabilities of the various plug-ins that may be used, the presence server(s) **140** may correctly identify that the user **120** is at home, but is not available to take another phone call.

As discussed above, in some example embodiments, the presence server(s) **140** may generate presence information, using the available presence plug-ins **144** that are binary in nature (e.g., present or not present), and in other example embodiments, the presence server(s) **140** may generate presence information that may provide a probability and/or confidence level associated with a presence and/or availability prediction (e.g., 80% confidence that Jay is in his car). The presence plug-ins **144** may use any suitable type of predictive modeling, or combinations or predictive models, such as, for example, a regression model and neural network model, for making the presence and/or availability predictions. The presence model(s) may be trained on historical data prior to deployment as part of the one or more presence plug-ins **144**.

As discussed above, in example embodiments, the presence model(s) **144**, as applied by the presence server(s) **140**, may consider more than one presence-event notification associated with a the user **120** and/or group of users to generate presence information. For example, the presence model(s) may access the presence-event notifications datastore **146** associated with the user **120** to generate one or more presence information. Indeed, different presence models may use different numbers and/or different types of presence-event notifications to generate presence information. Additionally, in some example embodiments, the presence model(s) as embodied in the presence plug-ins **144** may consider contextual information, such as the nature of the activities the user is engaged in and/or the state of the user, as may be provided in example presence event notifications, to generate presence information.

In some example embodiments, the presence model(s) and/or the presence plug-in(s) **144** within which the presence model(s) are embodied, may themselves generate presence-event notifications and/or other notifications that may be consumed by other plug-ins **144** to generate presence information. Thus, a particular presence model and/or presence plug-in **144** may use any suitable number and/or combination of presence-event notifications from user device(s) **122**, from other service servers, and/or from other plug-ins.

In some example embodiments, an egress filter **148** may be implemented to filter presence information, as generated by the presence server(s) **140**. The egress filter **148**, in example embodiments, may have egress filtering parameters based on criteria that may be universal, tailored to individual users **120**, and/or based at least in part on the service provider that may have access to the presence information. For example, a user **120** may request that presence information for him/her not be made available while he/she is at work. This criterion may be encoded in egress filter parameters to prevent the presence server(s) **140** from providing presence information pertaining to this user **120** during the hours indicated by the user **120**.

In some example embodiments, the presence server(s) **140** may tag the presence information with some type of identifier of the user **120** to which that presence information pertains. Thus, the presence information **120** may include a binary indicator, a probabilistic indicator, and/or an indicator of the user to which the presence information pertains. In some example embodiments, the presence information may further have a time stamp, and/or other suitable information. The presence server(s) **140** may stream **150** out the presence information and/or store the presence information, associated with the user, in a presence datastore **152**. The presence datastore **152**, in some example embodiments, may be accessible to retrieve, such as by using a reference to a corresponding user identification, presence information pertaining to a user **120**.

In some example embodiments, the presence server(s) **140** may aggregate presence information pertaining to a common user **120**. This may be performed when the presence server(s) **140** generate more than one presence information pertaining to a particular user **120**. The presence information pertaining to the particular user **120** may be aggregated into a single file and/or document before streaming **150** and/or storing in the presence datastore **152**.

In some example embodiments of the disclosure, the presence server(s) **140** may implement a time decay function for presence events that are published (e.g., streamed **150** or stored in the presence datastore **152**). The time decay function may decrement a probability or confidence level of a person being at and/or available at a location as time elapses from the occurrence of the presence event from which the presence information was generated. As newly revised probability for a user being at, or being available, is generated by the presence server(s) **140** by using the time decay function(s), the new probability may be published in a similar fashion as the initial presence information, such as by streaming **150** the new presence information and/or storing the new presence information in the presence datastore **152**. As discussed above, in alternate example embodiments, the presence servers **140**, instead of publishing updated time decayed presence information, may provide parameters that may allow service provider(s) **160** to decay the presence information. In this case, the presence servers **140** may provide a function, piecewise mapping, and/or any other indication of how a probability level and/or confidence level of presence information is to be decayed with time, along with the presence information itself.

In example embodiments, the one or more service provider(s) **160**(**1**), **160**(**2**), **160**(**3**), . . . , **160**(N) may interact with the network(s) **130** and the presence server(s) **140** via a corresponding service provider device **162**. Although in the interest of clarity a single service provider device **162** is depicted in FIG. **1**, in example embodiments, each service provider may have its own service provider device(s) **162** for interacting with the presence server(s) **140**. In example embodiments, the service provider(s) **160**, may be configured, via their service provider device(s) **162** to receive the stream **150** of presence information, as published by the presence server(s) **140**. In the same or different example embodiments, the service provider(s) **160**, may be configured, via their service provider device(s) **162** to access a query application program interface (API) **164** to send a request to the presence server(s) **140** for presence information associated with a particular user **120**. In example embodiments, the service provider device **162** may be

configured to generate, either through the query API **164**, or otherwise, a request for presence information, where the request indicates the user **120** for whom the request pertains, such as by referencing the user's user identification, user account, or any other identifier of the user **120**.

If the service provider **160** is authorized to receive the requested presence information and if the requested presence information exists, then the service provider **160** may receive the requested service information form the presence server(s) **140**. If the requested presence information does not exist, then, in some example embodiments, the service provider **160** may receive an indication, from the presence server(s) **140**, that the requested presence information not being available. If the service provider **160** is not authorized to receive the requested presence information, then, in some example embodiments, the service provider **160** may receive an indication, from the presence server(s) **140**, that the service provider **160** is not authorized to receive the requested presence information.

Once the service provider **160** receives, by streaming or by request, presence information pertaining to a user to whom the service provider **160** is to provide a service, consummating the service may be customized according to the received presence information. In some example embodiments, timing of the delivery of the service may be set based at least in part on the received presence information. In some other example embodiments, the mechanism, location, and/or user device **122** to which to deliver the service may be determined and/or modified based at least in part on the received presence information. In some other example embodiments, presence information of other users may be used to provide a service to a user.

As an example, a contacts service provider **160**(**1**) may receive presence information related to a particular user's contacts and display to the particular user the availability of the people on the particular user's contact list. In this way, the availability of a number of other users may be provided to a separate user as a service, so that the recipient of the service may know which one of his contacts may be available for any interaction that the recipient of the service may wish to initiate with his/her contacts. As another example, a messaging service provider **160**(**2**) may use presence information of a user to determine which one of the user's device to route a message that is intended for the user. In this way, the messaging service provider **160**(**2**) would route the message based on the location and the availability of the user for whom the message is intended. As yet another example, a delivery service provider **160**(**3**) may use presence information associated with a user to determine when and/or where to make a delivery. For example, the delivery service provider **160**(**3**) may dispatch a delivery to either the user's home or work, depending on the user's present location as determined from the presence information. Alternatively, the delivery service provider **160**(**3**) may determine if a home delivery of perishable and/or valuable items should be dispatched at the present time, based at least in part on whether the recipient is at home, as determined by presence information pertaining to that user, as received from the presence server(s) **140**.

FIG. **2** illustrates a schematic diagram of more than one example locations **200**, **230**, **250** at which a user **210**, **212** may be located, and the presence events that may be reported from these locations **200**, **230**, **250** associated with the user, in accordance with example embodiments of the disclosure. A first user **210** with a first user identification and/or first user account may be in a household with a second user **212** with a second user identification and/or user second user account. In the house **200**, there may be a number of user devices **122** that may contribute presence-event notifications that may come to the presence server(s) **140** as a presence-event notification stream **220**. In example embodiments, the user devices **122** and/or the presence server(s) **140** may be configured to distinguish between user **210** and user **212** when both of them are at home, by for example, any number of biometric data captured by any of the user devices **122**. Additionally, the detection of presence events may occur for the user **210** from three (or more) different locations, such as his/her home **200**, his/her office **230**, and/or his/her car **250**. Presence events generated in any one of these locations **200**, **230**, **250** may provide information pertaining to the location of the users **210**, **212** in any of the other locations **200**, **230**, **250**. In fact, the presence model(s) of the plug-ins **144** may use some a priori information, such as the members **210**, **212** of the household of the home **200** to make improved predictions compared to not using a priori information. In this way, presence information about another user **210** may enhance the quality of presence information about another user **212**. For example, if the presence-event notifications indicate that the user **210** is most likely in his/her car **250**, and at the same time coughing noises are detected, such as by an audio capture device **122**, in the home **200**, then, even without being able to ascribe the coughing to user **212**, the presence server may ascertain that it is user **212** that made the coughing sounds.

FIG. **3** illustrates a block diagram of an example architecture of a user device **122** that reports a presence event to one or more presence server(s) **140**, in accordance with example embodiments of the disclosure. The user device **122** may include one or more processor(s) **300**, one or more input/output (I/O) interface(s) **302**, one or more network interface(s) **304**, one or more storage interface(s) **306**, and computer-readable media **310**.

In some implementations, the processors(s) **300** may include a central processing unit (CPU), a graphics processing unit (GPU), both CPU and GPU, a microprocessor, a digital signal processor or other processing units or components known in the art. Alternatively, or in addition, the functionally described herein can be performed, at least in part, by one or more hardware logic components. For example, and without limitation, illustrative types of hardware logic components that may be used include field-programmable gate arrays (FPGAs), application-specific integrated circuits (ASICs), application-specific standard products (ASSPs), system-on-a-chip systems (SOCs), complex programmable logic devices (CPLDs), etc. Additionally, each of the processor(s) **300** may possess its own local memory, which also may store program modules, program data, and/or one or more operating systems. The one or more processor(s) **300** may include one or more cores.

The one or more I/O interface(s) **302** may enable the user device **122** to detect interaction with a user and/or other user devices **122**, from which interaction presence-event notifications may be generated. The I/O interface(s) **302** may include a combination of hardware, software, and/or firmware and may include software drivers for enabling the operation of any variety of I/O device(s) integrated on the user device **122** or with which the user device interacts, such as displays, microphones, speakers, cameras, switches, and any other variety of sensors, or the like. The network interface(s) **304** may enable the user device to communicate via the one or more network(s) **130**. The network interface(s) **304** may include a combination of hardware, software, and/or firmware and may include software drivers for enabling any variety of protocol-based communications,

and any variety of wireline and/or wireless ports/antennas. The storage interface(s) **306** may enable the processor(s) **300** to interface and exchange data with the computer-readable medium **310**, as well as any storage device(s) external to the user device **122**.

The computer-readable media **310** may include volatile and/or nonvolatile memory, removable and non-removable media implemented in any method or technology for storage of information, such as computer-readable instructions, data structures, program modules, or other data. Such memory includes, but is not limited to, RAM, ROM, EEPROM, flash memory or other memory technology, CD-ROM, digital versatile discs (DVD) or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, RAID storage systems, or any other medium which can be used to store the desired information and which can be accessed by a computing device. The computer-readable media **310** may be implemented as computer-readable storage media ("CRSM"), which may be any available physical media accessible by the processor(s) **300** to execute instructions stored on the memory **310**. In one basic implementation, CRSM may include random access memory ("RAM") and Flash memory. In other implementations, CRSM may include, but is not limited to, read-only memory ("ROM"), electrically erasable programmable read-only memory ("EEPROM"), or any other tangible medium which can be used to store the desired information and which can be accessed by the processor(s) **300**. The computer-readable media **310** may have an operating system (OS) and/or a variety of suitable applications stored thereon. The OS, when executed by the processor(s) **300** may enable management of hardware and/or software resources of the user device **122**.

Several modules such as instruction, data stores, and so forth may be stored within the computer-readable media **310** and configured to execute on the processor(s) **300**. The computer readable media **310** may have stored thereon a wireless module **312**, a video module **314**, a speech recognition module **316**, an event recognition module **318**, and a user recognition module **320**. The modules **312**, **314**, **316**, **318**, **320** may have instructions stored thereon that when executed by the processor(s) **300** may enable various functions pertaining the detection of presence events and the generation and transmission of presence-event notifications.

The instructions stored in the wireless module **312**, when executed by the processor(s) **300**, may configure the user device **122** to detect wireless connections, such as Wi-Fi connections, Bluetooth® connections, ZigBee® connections, or indeed any type of wireless connections. The processor(s) **300** may be configured to generate a presence-event notification based at least in part on a wireless connection that may be pre-existing and/or newly established by the user device **122**. For example, the processor(s) **300** may be configured to recognize a connection to a Wi-Fi AP that is associated with a particular location and may be configured to report that wireless connection to the Wi-Fi AP as a presence-event notification.

The instructions stored in the video module **314**, when executed by the processor(s) **300**, may configure the user device **122** to capture video, and based on the capture of the video, identify a presence event. In some example embodiments, the processor(s) **300** may be configured to perform facial recognition or other biometric analysis techniques to identify a particular user in a captured video or image. The processor(s) **300** may be configured to recognize a user in a video and or image and further may be configured to report that detection as a presence-event notification.

The instructions stored in the speech recognition module **316**, when executed by the processor(s) **300**, may configure the user device **122** to recognize speech, or indeed any noise (e.g., cough, sneeze, sniffling, shuffling noise, etc.) as a potential presence event. In some cases, a wake word uttered to a voice-controlled device may affect a recognition of a presence event. The processor(s) **300** may be configured to recognize a user in a sound and further may be configured to report that detection as a presence-event notification.

The instructions stored in the event recognition module **318**, when executed by the processor(s) **300**, may configure the user device **122** to identify a particular event as being a presence event. The processor(s) **300** may be configured to use any variety of actions to identify a presence event including, for example, a wireless connection between two user devices, a sound, a recorded video, a captured image, a detected motion, a user input, a toggling of a switch, an interaction with a smart appliance, an interaction with a voice-controlled device, an opening of a lock, a setting of a thermostat, a detected biometric signature, a detected cough, sneeze, sniffling, or shuffling noise, and/or a detected wake word

The instructions stored in the user recognition module **320**, when executed by the processor(s) **300**, may configure the user device **122** to identify a particular user associated with a detected presence event. The processor(s) **300** may be configured to perform a variety of functions such as determining that the interaction was intended by a user, determining that the action was preprogrammed to be automatic by a user when the user is in a particular location, facial recognition, voice recognition, signature sound recognition (e.g., a particular way of sneezing), and/or frequency of movement analysis. The processor(s) may be configured to communicate, by way of the presence-event notification, any type of attribution of a presence event to a particular user. For example, a motion detector may be tripped and it may not be clear if the user, or his/her pet tripped the motion detector. In this case, the processor(s) **300** may be configured to discern between the user and the pet based on a variety of factors, such as a frequency of movement and type of movements.

FIG. **4** illustrates a block diagram of example one or more presence server(s) **140** that receive presence-event notification(s) and provide presence information, in accordance with example embodiments of the disclosure.

The presence server(s) **140** may include one or more processor(s) **400**, one or more input/output (I/O) interface(s) **402**, one or more network interface(s) **404**, one or more storage interface(s) **406**, and computer-readable media **410**. The descriptions of the one or more processor(s) **400**, the one or more input/output (I/O) interface(s) **402**, the one or more network interface(s) **404**, the one or more storage interface(s) **406**, and the computer-readable media **410** may be substantially similar to the descriptions of the one or more processor(s) **300**, the one or more input/output (I/O) interface(s) **302**, the one or more network interface(s) **304**, the one or more storage interface(s) **306**, and the computer-readable media **310**, respectively, as described in FIG. **3** with respect to the user device **122**, and in the interest of brevity, will not be repeated here.

Several modules such as instruction, data stores, and so forth may be stored within the computer-readable media **410** and configured to execute on the processor(s) **400**. The computer readable media **410** may have stored thereon a streaming device data module **412**, an ingress filtering module **414**, a plug-in module **416**, an egress filtering module **418**, a presence streaming module **420**, an archiving

module **422**, a time decay module **424**, a presence information request module **426**, and a plug-in updating module **428**. Each of the modules **412**, **414**, **416**, **418**, **420**, **422**, **424**, **426**, **428** may have instructions stored thereon that when executed by the processor(s) **400** may enable various functions pertaining to receiving presence-event notifications, and providing presence information.

The instructions stored in the streaming device data module **412**, when executed by the processor(s) **400**, may configure the presence server(s) **140** to stream presence-event notifications. The processor(s) **400** may be configured to identify a user associated with each of the presence-event notification(s) that it receives. In some example embodiments, the processor(s) **400** may be configured to store the presence events that it receives.

The instructions stored in the ingress filtering module **414**, when executed by the processor(s) **400**, may configure the presence server(s) **140** to apply the incoming presence-event notifications to an ingress filter to filter out presence-event notifications that may not be allowed to be used for generating presence information. In some example embodiments, the processor(s) **400** may be configured to use ingress filter parameters for filtering out presence events. The processor(s) **400** may be configured to filter presence events notifications according to any variety of criteria, such as the type of the presence event, the users to which they pertain, the age of the users, the geography of the user, combinations thereof, user-defined criteria, or the like.

The instructions stored in the plug-in module **416**, when executed by the processor(s) **400**, may configure the presence server(s) **140** to apply a post-ingress filtered presence event, or a stream of post-ingress filtered presence events to one or more plug-in modules to generate presence information. In some example embodiments, the processor(s) **400** may be configured to generate presence information that are binary in nature (e.g., available or not available), and in other example embodiments, the processor(s) **400** may be configured to generate presence information that may provide a probability and/or confidence level associated with a presence and/or availability prediction. The processor(s) **400** may further be configured to train the presence model(s) of the plug-ins using historical data, prior to deployment as part of the one or more presence plug-ins. The presence model may be any suitable type of predictive model, probabilistic distribution, statistical model, analytical equation, linear or non-linear mapping, or indeed any type of predictive mechanism that may relate an incoming presence-event notification, or a group of presence-event notifications, to a prediction of the user and/or group of users associated with the incoming presence-event notification or group of presence-event notifications. Such models may include, for example, direct mapping, machine learning models, regression models, neural network models, any variety of statistical models, combinations thereof, or the like. The presence models, as embodied in the plug-ins may take into account various confidence levels of user detection associated with different types of presence events.

The instructions stored in the egress filtering module **418**, when executed by the processor(s) **400**, may configure the presence server(s) **140** to filter presence information, as generated by the presence server(s). The processor(s) **400** may be configured to use egress filtering parameters based on criteria that may be universal, tailored to individual users, and/or based at least in part on the service provider that may have access to the presence information, to perform the egress filtering.

The instructions stored in the presence streaming module **420**, when executed by the processor(s) **400**, may configure the presence server(s) **140** to stream **150** out the presence information to one or more service providers **160** and their service provider devices **162**. The instructions stored in the archiving module **422**, when executed by the processor(s) **400**, may configure the presence server(s) **140** to store the presence information in a presence datastore **152**. The processor(s) **400** may further be configured to aggregate presence information pertaining to a common user **120**. The processor(s) **400** may be configured to aggregate the presence information pertaining to the particular user **120** into a single file and/or document before streaming **150** and/or storing in the presence datastore **152**.

The instructions stored in the time decay module **424**, when executed by the processor(s) **400**, may configure the presence server(s) **140** to implement a time decay function for presence events that are published. The processor(s) **400** may be configured to decrement a probability or confidence level of a person **120** being at and/or available at a location as time elapses from the occurrence of the presence event from which the presence information was generated. As newly revised probability for a user being at a location, or being available, is generated by the processor(s) **400** by using the time decay function(s), the processor(s) **400** may be configured to published new probability in a similar fashion as the initial presence information, such as by streaming **150** the new presence information and/or storing the new presence information in the presence datastore **152**.

The instructions stored in the presence information request module **426**, when executed by the processor(s) **400**, may configure the presence server(s) **140** to receive a request for presence information from one or more service provider system(s) **162**, either directly, or via the query API **164**. The processor(s) **400** may further be configured to determine if the requesting service provider is authorized to receive the requested presence information, and if the service provider is authorized to receive the requested presence information, then the processor(s) **400** may be configured to retrieve the requested presence information from the presence datastore **152** and send the requested presence information to the requesting service provider **160**, via the requesting service's service provider device **162**.

The instructions stored in the plug-in updating module **428**, when executed by the processor(s) **400**, may configure the presence server(s) **140** to receive feedback event notifications, archive the feedback event notifications in a datastore, and use the feedback event notifications to retrain the presence model(s) of the plug-ins **144**. The processor(s) **400** may further be configured to deploy the updated presence models.

In example embodiments, the presence server(s) **140** may be implemented as a distributed computing environment where certain tasks are performed by remote processing devices that are linked through a communications network. In a distributed computing environment, program modules may be located in both local and remote memory storage devices. Additionally, in example embodiments, the presence server(s) **140** may be implemented in a remote fashion by one or more instances of a virtual machine. In such an implementation, relatively high levels of scalability may be realized if additional instances may be added and/or subtracted relatively quickly and based at least in part on bandwidth demands and processing and/or storage loads on the presence server(s) **140**.

FIG. **5** illustrates a block diagram of an example service provider device **162** that receives presence information and

is configured to dispatch one or more service(s), in accordance with example embodiments of the disclosure.

The service provider device **162** may include one or more processor(s) **500**, one or more input/output (I/O) interface(s) **502**, one or more network interface(s) **504**, one or more storage interface(s) **506**, and computer-readable media **510**. The descriptions of the one or more processor(s) **500**, the one or more input/output (I/O) interface(s) **502**, the one or more network interface(s) **504**, the one or more storage interface(s) **506**, and the computer-readable media **510** may be substantially similar to the descriptions of the one or more processor(s) **300**, the one or more input/output (I/O) interface(s) **302**, the one or more network interface(s) **304**, the one or more storage interface(s) **306**, and the computer-readable media **310**, respectively, as described in FIG. **3** with respect to the user device **122**, and in the interest of brevity, will not be repeated here.

Several modules such as instruction, data stores, and so forth may be stored within the computer-readable media **510** and configured to execute on the processor(s) **500**. The computer readable media **510** may have stored thereon a presence stream intake module **512**, a presence query module **514**, a user identification module **516**, a user preference module **518**, and a service dispatch module **520**. Each of the modules **512**, **514**, **516**, **518**, **520** may include instructions stored thereon that when executed by the processor(s) **500** may enable various functions pertaining to the intake, request, receipt, and use of presence information by a service provider device **162**.

The instructions stored in the presence stream intake module **512**, when executed by the processor(s) **500**, may configure the service provider device **162** to receive the stream **150** of presence information, as published by the presence server(s) **140**. The processor(s) **500** may be configured to further partition the stream into individual presence information.

The instructions stored in the presence query module **514**, when executed by the processor(s) **500**, may configure the service provider device **162** to generate, either through the query API **164**, or as a standalone message, a request for presence information, where the request indicates the user **120** for whom the request pertains, such as by referencing the user's user identification, user account, or any other identifier of the user **120**.

The instructions stored in the user identification module **516**, when executed by the processor(s) **500**, may configure the service provider device **162** to identify users **120** associated with presence information that is received via the stream **150** of presence information, as provided by the presence server(s) **140**.

The instructions stored in the user preference module **518**, when executed by the processor(s) **500**, may configure the service provider device **162** to access user preference(s) associated with a particular user, as stored in association with the user's user identification (e.g., such as in a user account). The user preference(s) may indicate how to deliver service(s), using the presence information, such that user satisfaction may be enhanced. For example, a user **120** may prefer to have packages delivered to his/her work address. The processor(s) **500** may be configured to use this knowledge to attempt to deliver a package to the user's work address after confirming using the presence information that he/she is indeed at work.

The instructions stored in the service dispatch module **520**, when executed by the processor(s) **500**, may configure the service provider device **162** to dispatch a service. The processor(s) **500** may be configured to determine the manner (e.g., time, mechanism, location, etc.) based at least in part on the presence information and/or user preferences.

FIG. **6** illustrates a flow diagram of an example method **600** for providing presence-event notifications to a presence server, in accordance with example embodiments of the disclosure. In example embodiments, the method **600** may be performed by the user device **122** and the processor(s) **300** thereon by executing instructions stored in computer-readable media **310**, in cooperation with one or more other components as depicted in environment **100** of FIG. **1**.

At block **602**, an event notification may be generated responsive to a potential presence event. The event notification may be generated responsive to an intentional and/or unintentional (by the user **120**) interaction with the user device **120**. At this point, the event notification may further entail any type of environmental element (e.g., noise, light, etc.) that may be perceived by the user device **122** as a potential interaction with a user **120** and/or another user device **122**. In some example embodiments, the interaction of a device with a service may itself be a presence-event notification. For example, in some cases, a voice activated device **122**(**1**) transmitting a notification of a wake word may, itself, be an event notification. In some example embodiments, the user device **122** may manage its sensor(s) for power management, such as by turning off a microphone when there may be continuous background sound and/or noise. Thus, in some example embodiments, the user device **122** may make a determination as to whether an event is to be recorded as an event notification.

At block **604**, one or more event notification rules may be applied to determine if the event of the event notification is likely to be a presence event. The event notification rules may determine if the potential presence event is indeed likely to be a presence event. If the user device **122** determines that it detected environmental noise (e.g., a truck passing by outside, etc.) without any further follow-up interaction, then the user device may determine that that potential presence event is not, in fact, a true presence event, but rather just an artifact. However, other interactions, such as speaking a wake word, or a detected attempt at a follow-up interaction by the user, when the first interaction may have been ambiguous as to whether it was a presence event, may be indicative of the potential presence event actually being a presence event. In some alternate embodiments, a determination of whether an event notification is indeed a presence-event notification may be performed at a remote location, such as a service server associated with a service and/or the presence server(s) **140**.

At block **606**, it may be determined if the event is a presence event based on the application of the one or more event notification rules, as performed in block **604**. If the event is determined to not be a presence event, then the method may return to block **602** to generate the next event notification. If, however, the event is determined to be a presence event, then the method **600** may proceed to optional block **608**, where the event notification may be edited. At this point, the event notification of block **602** may be called a presence-event notification. The edits may entail providing more detail as to the presence event, such as an indication of speech, video, or detecting device related information associated with the detection of the presence event. In some example embodiments, such edits may be made as attachments and/or metadata associated with the presence-event notification.

At block **610**, a user identification and/or user device identification may be associated with the presence-event notification. In example embodiments the user identification

may entail providing the user identification as metadata, an attachment, a companion file, and/or incorporation of the payload of the presence-event notification itself.

At block **612**, the presence-event notification may be transmitted to the presence server(s). The presence-event notification may optionally have the user identification indicated, such as in the presence-event notification itself, metadata, and/or an attachment to the presence-event notification.

In some example embodiments, in addition to the user device **122** generating presence event notifications, other entities, such as service servers (e.g., email server, calendar server, social media server, ecommerce server, etc.) may generate presence-event notifications for a user **120** and based at least in part on user activities that may be transmitted to the presence server(s) **140**. It will also be appreciated that some of the operations, as discussed above, may be performed on the presence server(s) **140**. For example, in some cases, the user device **122** may not perform the processes for determining if an event is indeed a presence event. In these cases, such a determination may be performed at another entity, such as the presence server(s) **140**.

Although the process **600** is described with reference to the flowchart illustrated in FIG. **6**, many other methods for performing the acts associated with the process **600** may be used. For example, the order of the steps may be changed, some of the steps described may be optional, and additional steps may be included, in accordance with example embodiments of the disclosure.

FIG. **7** illustrates a flow diagram of an example method **700** for receiving a presence-event notification and providing presence information, in accordance with example embodiments of the disclosure. In example embodiments, the method **600** may be performed by the presence server(s) **140** and the processor(s) **400** thereon by executing instructions stored in computer-readable media **410**, in cooperation with one or more other components as depicted in environment **100** of FIG. **1**.

At block **702**, a presence-event notification may be received. In some cases, a user identification and/or user device identification may be provided in and/or with the presence-event notification, as received from the user device **122**, another service server, and/or another plug-in. In other cases, the presence-event notification may include an identification of the user device **122** that generated the presence-event notification, but not the user identification. The presence-event notification may further include the type of presence event (e.g., utterance of the wake word, etc.).

At block **704**, a user identification and/or user device identification associated with the presence-event notification may be identified. In the case where the user identification is provided with the presence-event notification, the user identification may be extracted, such as by parsing the presence-event notification. In the case where the reporting user device identification is provided, a table associating the user device identifications to user identifications may be consulted. This table may, in example embodiments, be stored at the presence server(s) **140**, such as associated with a user account for each users **120** who interact with the presence services, as provided by the presence server(s) **140**.

At block **706**, ingress filter parameters associated with the user may be accessed. It should be noted that in some example embodiments, all users **120**, or groups of users **120** may be associated with the same ingress filter parameters. In other example embodiments, users **120** may have individualized sets of ingress filter parameters. In still further example embodiments, the ingress filter parameters for a user **120** may be user-defined. In other words, the user **120** may specify which presence-event notifications or types of presence-event notifications may not be used for determining presence information for that user.

At block **708** it may be determined if the presence-event notification is to be filtered according to the ingress filter parameters. The presence-event notification may be compared to the ingress filter parameters to determine if the presence event associated with the presence-event notification is disallowed from being used to determine presence information for the user. If it is determined that the presence-event notification is to be filtered, then the method **700** may proceed to block **710**, where the presence-event notification may be discarded, and the method **700** may return to block **702** to receive the next presence-event notification. If, however, at block **708** it is determined that the presence-event notification is not to be discarded, then the method **700** may proceed to block **712**, where the presence-event notification may be applied to one or more plug-ins. In some example embodiments, not all of the plug-ins **144** may be permitted to receive every type (e.g., for every user, for every user activity, etc.) of presence-event notifications. In these embodiments, the presence server(s) **140** may determine if each of the particular plug-ins **144** are to receive a received presence-event notification.

At block **714**, it may be determined if presence information is generated and/or updated. If the presence event of the presence-event notification is relatively insignificant, then presence information may not result from that presence-event notification. If no presence information is generated and/or updated, then the method may return to block **702** to receive the next presence-event notification. If, however, at block **714**, presence information is generated, then the method **700** may proceed to block **716**, where egress filter parameter(s) may be accessed, where the egress filter parameters may be associated with at least one or more of the user identification (e.g., the user), the plug-in, and/or presence information consuming service(s).

At block **718**, it may be determined if the presence information is to be filtered, based at least in part on the egress filter parameters. If the presence information is to be filtered out according to the egress filter parameters, then the presence information may not be published, and the method may return to block **702** to receive the next presence-event notification.

If, however, the presence information is not to be filtered out, then the method **700** may proceed to block **720**, where the presence information may be streamed **150** to one or more service provider(s) **160** and/or archived in the presence database **152**. After streaming and/or archiving the presence information, the method **700** may return to **702** to receive additional presence event notifications.

In some example embodiments, there may be one or more plug-ins **144** that may consume presence information generated by other presence plug-ins **144**. In these cases, the presence information may be provided to one or more dependent plug-ins **144**.

Although the process **700** is described with reference to the flowchart illustrated in FIG. **7**, many other methods for performing the acts associated with the process **700** may be used. For example, the order of the steps may be changed, some of the steps described may be optional, and additional steps may be included, in accordance with example embodiments of the disclosure.

FIG. **8** illustrates a flow diagram of an example method **800** for generating a revised probability of a user being present at a particular location, in accordance with example

embodiments of the disclosure. In example embodiments, the method **800** may be performed by the presence server(s) **140** and the processor(s) **400** thereon by executing instructions stored in computer-readable media **410**, in cooperation with one or more other components as depicted in environment **100** of FIG. **1**.

At block **802**, one or more presence-event notifications associated with a user may be received. The one or more presence-event notifications may be received from one or more user devices **122**, from service servers with which the user **120** has interacted, and/or from one or more plug-ins that may have previously generated information about the user. In example embodiments, each of the one or more presence-event notifications may be retrieved from the presence-event notification datastore **146**.

At block **804**, an initial weight associated with each of the one or more presence-event notifications may be determined. The weight corresponding to each of the one or more presence-event notifications may be based at least in part on the age (e.g., elapsed time from generation, etc.) of each of the presence-event notifications.

At block **806**, presence information associated with the user may be generated based at least on the one or more presence-event notifications and their corresponding respective weights. The presence information may be generated using one or more of the presence plug-ins **144** having presence models incorporated therein. The weights may provide an indication to each of the presence models of the confidence associated with the corresponding presence-event. The confidence of a presence event as a predictor of a person's location, availability, and/or propensity to engage in an activity generally decreases with elapsed time after the occurrence of the presence event. As a result, the weight associated with the presence event may provide a mechanism for the presence plug-ins to consider effects of a particular amount of elapsed time after the occurrence of a particular presence event that is used to generate the presence information.

At **808**, the presence information for the user may be published. Publishing this revised presence information may entail streaming **150** the revised presence information and/or storing the revised presence information in the presence datastore **152**.

At block **810**, the method **800** may wait a predetermined period of time before performing any type of reweighting of the presence-event notifications used for determining the presence information. After waiting the predetermined period of time, at block **812**, the presence-event notifications may be applied to a time decay function that may adjust (e.g., decrease) the weight associated with each of the presence-event notifications for the presence models using those presence-event notifications and corresponding weights. The time decay function may provide any suitable mapping of how the weight of each of the presence-event notifications are to decay with time.

At block **814**, it may be determined if all the presence-event notifications have elapsed. In other words, it may be determined if the presence-event notifications are old enough, so that those presence-event information may no longer be useful and the revised probability of presence information is at a relatively low level for the presence information to provide much usefulness in the context of service delivery or predictive power of the user actions. If the original presence information has elapsed, then the method **800** may end **816**. On the other hand, if the original presence information has not elapsed, then the method **800** may return back to block **806**, where new presence information may be generated based at least in part on time decayed weights associated with each of the presence-event notifications.

The method **800** may be reset if new presence-event notifications come in to the presence server(s) **140** for the user that may be used to produce fresh presence information for the user. In that case, old presence-event notifications may be replaced with new presence-event notifications, rendering moot the need to decrement the weight of the old presence-event notifications that are not used in subsequent presence information generation.

Although the process **800** is described with reference to the flowchart illustrated in FIG. **8**, many other methods performing the acts associated with the process **800** may be used. For example, the order of the steps may be changed, some of the steps described may be optional, and additional steps may be included, in accordance with example embodiments of the disclosure.

FIG. **9** illustrates a flow diagram of an example method **900** for receiving a request for presence information and fulfilling the request, in accordance with example embodiments of the disclosure. In example embodiments, the method **900** may be performed by the presence server(s) **140** and the processor(s) **400** thereon by executing instructions stored in computer-readable media **410**, in cooperation with one or more other components as depicted in environment **100** of FIG. **1**.

At block **902**, a request for presence information associated with a user identification may be received from a requesting service. In some example embodiments, the notification may be a message generated at the service provider system **162**. In other example embodiments, the request may be generated via the query API **164**.

At block **904**, it may be determined if the requesting service is authorized to receive the requested presence information. If it is determined that the requesting service provider **160** is not authorized to receive the requested presence information, then at block **906**, optionally, the requesting service may be notified that the requesting service is not authorized to receive the requested presence information. In some example embodiments, no notification of a lack of authorization to receive the requested presence information may be provided to the requesting service provider **160**. In some cases, the requesting service provider **160** may interpret a lack of a response to indicate that either the requested presence information is not available, or that the requesting service provider **160** is not authorized to receive the requested presence information. On the other hand, if at block **906**, it is determined that the requesting service is authorized to receive the requested presence information, then the method **900** may proceed to block **908** where it may be determined if the requested presence information is available. The presence datastore **152** may be accessed to determine whether the requested presence information is available. The user identification may be used to reference the requested presence information in the presence datastore **152**.

At block **910**, if it is determined that the requested presence information is not available, then the method **900** may optionally notify the requesting service that the requested presence information is not available at block **912**. In some example embodiments, no notification of unavailability of the requested presence information may be provided. If, however, at block **910**, the requested presence information is available, such as stored in the presence datastore **152**, then the method **900** may proceed to block **914**, where the requested presence information may be

obtained from the presence datastore **152**. In some example embodiments, there may be a tier of user permission that may gate the disbursement of presence information. For example, there may be an additional check for user **122** authorization for his/her her presence information (e.g., egress filtering, or otherwise) before the presence information is provided to a requesting service. At block **916**, the requested presence information may be transmitted to the requesting service.

Although the process **900** is described with reference to the flowchart illustrated in FIG. **9**, many other methods performing the acts associated with the process **900** may be used. For example, the order of the steps may be changed, some of the steps described may be optional, and additional steps may be included, in accordance with example embodiments of the disclosure.

FIG. **10** illustrates a flow diagram of an example method **1000** of receiving a stream of presence-event notifications, generating presence information from the stream, and publishing the presence information, in accordance with example embodiments of the disclosure. In example embodiments, the method **1000** may be performed by the presence server(s) **140** and the processor(s) **400** thereon by executing instructions stored in computer-readable media **410**, in cooperation with one or more other components as depicted in environment **100** of FIG. **1**.

At block **1002**, a stream of presence-event notifications may be received. As discussed above, the stream **150** may include presence-event notifications from multiple users **120** and multiple user devices **122**. At block **1004**, a user identification corresponding to each filtered presence-event notification may be identified. In some example embodiments, this may entail parsing the presence-event notification to identify the appended user identification. In other example embodiments, the presence-event notification may include a user device identification, and the user device identification may be used to identify the user associated with each of the presence-event notifications in the stream **150**. At block **1006**, the stream of presence notifications may be applied to an ingress filter to generate a stream of filtered presence-event notifications.

At block **1008**, each filtered presence-event notification is applied to one or more plug-ins. At block **1010**, presence information corresponding to each user identification may be generated. The presence information, therefore, is based at least in part on the presence-event notifications for each of the users and the presence models embodied in the presence plug-ins **144**. At block **1012**, the presence information corresponding to each user identification may be applied to an egress filter to generate filtered presence information. At block **1014**, optionally, filtered presence information may be aggregated for each user identification into user presence files, where each user presence file corresponds to a respective user identification.

At block **1016**, the filtered presence information may be published. Publishing, in example embodiments, may entail providing the presence information in an outbound stream. In other example embodiments, publishing may entail storing, such as for future query, the presence information, associated with its corresponding user identification in the presence datastore **152**. In yet other example embodiments, the presence file corresponding to each user identification, may be streamed out to one or more service providers and/or stored in the presence datastore **152** for future query.

Although the process **1000** is described with reference to the flowchart illustrated in FIG. **10**, many other methods performing the acts associated with the process **1000** may be used. For example, the order of the steps may be changed, some of the steps described may be optional, and additional steps may be included, in accordance with example embodiments of the disclosure.

FIG. **11** illustrates a flow diagram of an example method **1100** of receiving feedback event notification(s) and revising plug-in models based on the received feedback event notification, in accordance with example embodiments of the disclosure. In example embodiments, the method **1100** may be performed by the presence server(s) **140** and the processor(s) **400** thereon by executing instructions stored in computer-readable media **410**, in cooperation with one or more other components as depicted in environment **100** of FIG. **1**.

At block **1102**, a feedback event notification associated with a user identification may be received from a service. The feedback event may be a determination, by a service provider **160**, of whether a user **120** was in a particular location and/or available. In some cases, the feedback event may agree with what the presence information predicted, and in other cases, the feedback event notification may be contrary to what was predicted by the presence information. At block **1104**, the feedback event notification may be archived, as associated with the user identification. This feedback event notification may be archived in any suitable datastore, such as the presence datastore **152**.

At block **1106**, it may be determined if a retraining of the plug-in(s) (e.g., the presence models of the plug-ins) are to be performed. This determination may be made by considering any one or more of how much time has passed since the last training of the models, the number of feedback event notifications that have accumulated in the archive, and/or how the models are performing (e.g., the number of incorrect predictions). If it is determined that a retraining is not to be performed, then the method may return to block **1102** to receive additional feedback event notifications. However, if it is determined that a retraining is to be performed, then the method **1100** may proceed to block **1108**, where the plug-in model(s) are retrained based at least in part on the feedback event notification.

At block **1110**, it may be determined if any of the plug-in model(s) have changed. If none of the plug-in model(s) have changed, then the method may return to block **1102** to receive additional feedback event notification(s). If, on the other hand, at least one plug-in model has changed as a result of the retraining, then at block **1112**, any of the plug-in model(s) that changed may be updated in the plug-in. As a result, future determinations of presence information may use the retrained presence model(s), as provided in the one or more plug-ins **144**.

When a presence model is updated, the updated model may not only benefit, by way of relatively greater accuracy and/or precision, the service provider **160** that may have prompted, or was most responsible in triggering a retraining of the model, but all of the service providers **160** that may use that revised model.

Although the process **1100** is described with reference to the flowchart illustrated in FIG. **11**, many other methods performing the acts associated with the process **1100** may be used. For example, the order of the steps may be changed, some of the steps described may be optional, and additional steps may be included, in accordance with example embodiments of the disclosure.

FIG. **12** illustrates a flow diagram of an example method **1200** for receiving presence information and dispatching a service based at least in part on the presence information, in accordance with example embodiments of the disclosure. In example embodiments, the method **1200** may be performed

by the service provider device **162** and the processor(s) **500** thereon by executing instructions stored in computer-readable media **510**, in cooperation with one or more other components as depicted in environment **100** of FIG. **1**.

At block **1202**, a stream of presence information may be received. The presence information, in example embodiments, may be tagged with a user identification. At block **1204**, a user identification associated with one or more of the presence information received in the stream of presence information may be determined.

At block **1206**, a service may be provided to at least one user based at least in part on the one or more presence information. For example, a telemarketing service may determine that a particular user, as identified by the operations in block **1204**, may be available to receive a call, as determined by presence information about the user in the stream of presence information, and in turn, the telemarketer may place a call to this user. The service, as discussed herein, may be any suitable type of service, including, for example, physical or electronic delivery of items or services, targeting of advertising, targeting of marketing (e.g., coupons, incentives, etc.), providing other context-based information, combinations thereof, or the like. For example, if a particular person is listening to music by a particular artist, the presence information may include contextual information that indicates the particular artist and/or the song, and a service may attempt to sell additional music produced by that artist.

Although the process **1200** is described with reference to the flowchart illustrated in FIG. **12**, many other methods performing the acts associated with the process **1200** may be used. For example, the order of the steps may be changed, some of the steps described may be optional, and additional steps may be included, in accordance with example embodiments of the disclosure.

FIG. **13** illustrates a flow diagram of an example method **1300** for receiving a stream of presence information and determining if a service is to be dispatched based at least in part on the stream of presence information, in accordance with example embodiments of the disclosure. In example embodiments, the method **1300** may be performed by the service provider device **162** and the processor(s) **500** thereon by executing instructions stored in computer-readable media **510**, in cooperation with one or more other components as depicted in environment **100** of FIG. **1**.

At block **1302**, a stream of presence information may be received. The presence information that make up the stream **150**, in example embodiments, may be tagged with a user identification. At block **1304** a user identification may be identified for at least one of the presence information from the stream. In some example embodiments, this may be performed by parsing the presence information to detect the user identification provided therein.

At block **1306**, it may be determined if a service is to be provided to a user associated with the user identification, as determined in block **1304**. If a service is not to be provided to the user, then the method **1300** may return to block **1302** where the stream of presence information may be continued to be received. If, however, it is determined at block **1306** that a service is to be provided to the user, then the method may proceed to block **1308**, where it may be determined if the service is to be provided at this present time, based at least in part on the presence information. If it is determined that the service is not to be provided at the present time, for example, because the user is not currently available per the presence information, then the method may return to block **1302** to continue to receive the stream of presence information. If, on the other hand, at block **1308** it is determined that the service is to be provided at the present time, then the method may proceed to block **1310**, where the service may be dispatched. In some example embodiments, a mechanism by which to dispatch and/or provide the service may further be determined using contextual information that may be available about the user or group of users in the presence information received.

Although the process **1300** is described with reference to the flowchart illustrated in FIG. **13**, many other methods performing the acts associated with the process **1300** may be used. For example, the order of the steps may be changed, some of the steps described may be optional, and additional steps may be included, in accordance with example embodiments of the disclosure.

FIG. **14** illustrates a flow diagram of an example method **1400** for generating and transmitting a request for presence information, and dispatching a service based on received presence information, in accordance with example embodiments of the disclosure. In example embodiments, the method **1400** may be performed by the service provider device **162** and the processor(s) **500** thereon by executing instructions stored in computer-readable media **510**, in cooperation with one or more other components as depicted in environment **100** of FIG. **1**.

At block **1402**, it may be determined that a service is to be provided to a user. At block **1404**, a request for presence information for the user may be generated, where the request may include a user identification associated with the user. In some example embodiments, the user notification may be a message formed by the service provider system **162**. In other example embodiments, the request may be via the query API **164** for requesting presence information.

At block **1406**, the request may be transmitted to one or more presence server(s). In response to the request, at block **1408**, presence information associated with the user may be received from the one or more presence server(s). At block **1410**, it may be determined if the service is to be delivered at the present time based at least in part on the presence information.

At block **1412**, a mechanism by which to provide the service may be determined based at least in part on the presence information. This mechanism may entail any variety of suitable options, such as what physical location to use for providing the service, what user device to provide the service on, or the like. In some cases, the mechanism may entail using contextual information to tailor the service to the user or group of users that are to receive the service. For example, the service may be delivery of advertising, and the mechanism of service delivery may entail determining what advertisement is to be provided to a user, based on contextual information, such as demographic and/or interest information about the user that may be available in the presence information.

At block **1414**, the service may be dispatched according to the determined mechanism from the processes of block **1412**. After dispatching the service, the method **1400** may return back to block **1402** to provide the next service.

Although the process **1400** is described with reference to the flowchart illustrated in FIG. **14**, many other methods performing the acts associated with the process **1400** may be used. For example, the order of the steps may be changed, some of the steps described may be optional, and additional steps may be included, in accordance with example embodiments of the disclosure.

FIG. **15** illustrates a schematic diagram of an example environment **1500** where presence-event notifications are

generated for a user **1510**, filtered, and then used to generate presence information **1550**, in accordance with example embodiments of the disclosure. The user, Bob **1510**, may have user devices that generate the presence-event notifications **1512** of EN**0**, EN**1**, EN**2**, and EN**3**. These presence-event notifications **1512** may be sent to the presence server(s) **140** at substantially the same time as they are generated. At the presence server(s) **140** the presence-event notifications **1512** may be applied to an ingress filter **1520** that is specific to Bob **1510**. The ingress filter **1520** may specify presence events that may not be used for the purposes of generating presence information, and thus are to be filtered out and discarded prior to application to any presence plug-ins **1540**. After ingress filtering, a filtered set of presence-event notifications **1530** may be generated. The filtered set of presence-event notifications may also be stored in the presence-event notification datastore **146**. The pre-filtered presence-event notification of EN**1** may be filtered out because the ingress filter **1520** does not allow the use of front door/smart lock-based presence events to be used after 9 PM. The filtered set of presence-event notifications **1530** may be applied to a set of plug-ins **1540**. This may result in the generation of presence information **1550**, where the presence information at times T_0, T_2, and T_3 are based on evaluation of the filtered presence-event notifications, and the presence information at times $T_{0.5}$, $T_{1.5}$, and $T_{2.5}$ are due to time-based decay. The presence information for Bob **1550** may be stored in presence datastore **152**.

FIG. **16** illustrates a schematic diagram of an example environment **1600** where presence information **1612**, **1620**, **1626**, **1632** is requested **1610**, **1618**, **1624**, **1630** by a variety of service providers **160**(**1**), **160**(**2**), **160**(**3**), **160**(**4**) and used to provide services **1614**, **1622**, **1628**, **1634**, in accordance with example embodiments of the disclosure. Each of the service providers **160** may send a request for presence information **1610**, **1618**, **1624**, **1630** and receive presence information **1612**, **1620**, **1626**, **1632** in response to the requests **1610**, **1618**, **1624**, **1630**, respectively, based at least in part on a filter **1602** that specifies what information the service providers **160** are allowed to get for various users (e.g., Bob, Pam, Amy, Tom, and Hal) from the presence server(s) **140**, as obtained for the presence datastore **152**. Based at least in part on the presence information **1612** received, service provider **160**(**1**) may be able to provide availability information for all the people on Hal's contacts **1614**, except Pam, as displayed on Hal's smartphone **1616**. Based at least in part on the presence information **1620** received, service provider **160**(**2**) may route a message to Amy's Smart TV **1622**. Based at least in part on the presence information **1626** received, service provider **160**(**3**) may dispatch a delivery of perishable food to Hal at his home **1628**. Based at least in part on the presence information **1632** received, service provider **160**(**4**) may prioritize making telemarketing calls to Pam **1634**.

Although the subject matter has been described in language specific to structural features and/or methodological acts, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to the specific features or acts described. Rather, the specific features and acts are disclosed as illustrative forms of implementing the claims.

The disclosure is described above with reference to block and flow diagrams of systems, methods, apparatuses, and/or computer program products according to example embodiments of the disclosure. It will be understood that one or more blocks of the block diagrams and flow diagrams, and combinations of blocks in the block diagrams and flow diagrams, respectively, can be implemented by computer-executable program instructions. Likewise, some blocks of the block diagrams and flow diagrams may not necessarily need to be performed in the order presented, or may not necessarily need to be performed at all, according to some embodiments of the disclosure.

Computer-executable program instructions may be loaded onto a general-purpose computer, a special-purpose computer, a processor, or other programmable data processing apparatus to produce a particular machine, such that the instructions that execute on the computer, processor, or other programmable data processing apparatus create means for implementing one or more functions specified in the flowchart block or blocks. These computer program instructions may also be stored in a computer-readable memory that can direct a computer or other programmable data processing apparatus to function in a particular manner, such that the instructions stored in the computer-readable memory produce an article of manufacture including instruction means that implement one or more functions specified in the flow diagram block or blocks. As an example, embodiments of the disclosure may provide for a computer program product, comprising a computer usable medium having a computer readable program code or program instructions embodied therein, said computer readable program code adapted to be executed to implement one or more functions specified in the flow diagram block or blocks. The computer program instructions may also be loaded onto a computer or other programmable data processing apparatus to cause a series of operational elements or steps to be performed on the computer or other programmable apparatus to produce a computer-implemented process such that the instructions that execute on the computer or other programmable apparatus provide elements or steps for implementing the functions specified in the flow diagram block or blocks.

Each of the memories and data storage devices described herein can store data and information for subsequent retrieval. The memories and databases can be in communication with each other and/or other databases, such as a centralized database, or other types of data storage devices. When needed, data or information stored in a memory or database may be transmitted to a centralized database capable of receiving data, information, or data records from more than one database or other data storage devices. In other embodiments, the databases shown can be integrated or distributed into any number of databases or other data storage devices.

Many modifications and other embodiments of the disclosure set forth herein will be apparent having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the disclosure is not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

What is claimed is:

1. A system comprising:

one or more processors; and

one or more non-transitory computer-readable media storing computer-executable instructions that, when executed by the one or more processors, cause the one or more processors to perform operations comprising:

storing first data that associates a first service with a user profile;

storing second data that associates a second service with the user profile;

sending, to one or more computing devices, a request for presence information associated with the user profile;

receiving the presence information from the one or more computing devices, the presence information corresponding to a location of a user associated with the user profile;

determining first criteria associated with initiating the first service;

determining second criteria associated with initiating the second service, the second criteria being different than the first criteria;

determining, based at least in part on the first criteria, that the presence information is insufficient for initiating the first service;

refraining from initiating the first service;

determining, based at least in part on the second criteria, that the presence information is sufficient for initiating the second service; and

initiating the second service.

2. The system of claim **1**, the operations further comprising:

storing third data that associates a third service with an additional user profile;

sending, to the one or more computing devices, an additional request for additional presence information associated with the additional user profile;

receiving the additional presence information from the one or more computing devices; and

determining, based at least in part on the additional presence information, that an additional user associated with the additional user profile is unavailable for receiving the third service.

3. The system of claim **1**, wherein the presence information comprises a probability of at least one of: (i) the user being at the location; or (ii) the user being available to receive the second service.

4. The system of claim **1**, the operations further comprising:

storing third data that associates a third service with an additional user profile;

sending, to the one or more computing devices, an additional request for additional presence information associated with the additional user profile; and

receiving, from the one or more computing devices, an indication of a lack of authority to receive the additional presence information.

5. The system of claim **1**, wherein initiating the second service comprises at least one of: (i) advertising availability of the user to an additional user; (ii) initiating a delivery to the user; (iii) sending a message to a user device associated with the user; (iv) causing a phone call to be place to the user; (v) initiating a video conference with the user; (vi) sending an advertisement to the user; (vii) offering a product or service for sale to the user; or (viii) offering an incentive to purchase a product or service to the user.

6. The system of claim **1**, the operations further comprising:

determining that the user is located at a particular location associated with the second service;

generating notification data representing feedback associated with the second service based at least in part on the user being located at the particular location; and

sending the notification data to the one or more computing devices.

7. The system of claim **1**, the operations further comprising receiving an indication that the system is authorized to receive the presence information associated with the user profile.

8. The system of claim **1**, the operations further comprising:

determining, based at least in part on the presence information, a first probability associated with the user accepting or engaging the first service and a second probability associated with the user accepting or engaging the second service;

determining that the first probability fails to satisfy a threshold probability; and

determining that the second probability satisfies the threshold probability,

wherein:

refraining from initiating the first service is based at least in part on the first probability failing to satisfy the threshold probability, and

initiating the second service is based at least in part on the second probability satisfying the threshold probability.

9. A method comprising:

storing first data that associates a first service with a user profile of a user;

storing second data that associates a second service with the user profile of the user;

sending, to one or more computing devices, a request for presence information associated with the user profile;

receiving the presence information from the one or more computing devices;

determining first criteria associated with initiating the first service;

determining second criteria associated with initiating the second service;

determining, based at least in part on the first criteria, that the presence information is insufficient for initiating the first service;

refraining from initiating the first service;

determining, based at least in part on the second criteria, that the presence information is sufficient for initiating the second service; and

initiating the second service.

10. The method of claim **9**, further comprising:

storing additional data that associates an additional service with an additional user profile;

sending, to the one or more computing devices, an additional request for additional presence information associated with the additional user profile;

receiving the additional presence information from the one or more computing devices; and

determining, based at least in part on the additional presence information, to delay initiating of the additional service.

11. The method of claim **9**, further comprising:

determining, based at least in part on the presence information, a probability that the user is at a location associated with receiving the second service; and

determining that the probability is greater than a threshold,

wherein initiating the second service is based at least in part on determining that the probability is greater than the threshold.

12. The method of claim **9**, further comprising receiving, from the one or more computing devices and after a period

of time, additional presence information, the additional presence information indicating that the user is unavailable to receive the first service.

13. The method of claim **9**, further comprising:

storing additional data that associates an additional service with an additional user profile;

sending, to the one or more computing devices, an additional request for additional presence information associated with the additional user profile; and

receiving, from the one or more computing devices, an indication of a lack of authority to receive the additional presence information.

14. The method of claim **9**, wherein initiating the second service comprises at least one of: (i) advertising availability of the user to an additional user; (ii) initiating a delivery to the user; (iii) sending a message to a user device associated with the user; (iv) causing a phone call to be placed to the user; (v) initiating a video conference with the user; (vi) sending an advertisement to the user; (vii) offering a product or service for sale to the user; or (viii) offering an incentive to purchase a product or service to the user.

15. The method of claim **9**, wherein the at least two second criteria comprises:

an availability associated with the user receiving the second service;

a location associated with the user; or

a propensity of the user to engage in the second service.

16. A system comprising:

one or more processors; and

one or more non-transitory computer-readable media storing computer-executable instructions that, when executed by the one or more processors, cause the one or more processors to perform operations comprising:

determining that a service is to be provided to a user associated with a user profile;

receiving first presence information from one or more computing devices;

determining, based at least in part on the service, a first criteria and a second criteria associated with initiating the service;

determining that the first criteria is satisfied by the first presence information;

determining that the second criteria is not satisfied by the first presence information;

determining, based at least in part on second criteria not being satisfied by the first presence information, to refrain from initiating of the service;

receiving second presence information from the one or more computing devices;

determining that the second criteria is satisfied by the second presence information; and

determining to initiate of the service.

17. The system of claim **16**, the operations further comprising:

generating a request for the first presence information, the request indicating at least the user profile; and

sending the request to the one or more computing devices.

18. The system of claim **16**, the operations further comprising determining a type of presence information associated with the first presence information, and wherein determining that the second criteria is not satisfied by the first presence information is based at least in part on the type of presence information.

19. The system of claim **16**, wherein:

the first criteria includes a location of the user; and

the second criteria includes:

an availability of the user, or

a probability of the user engaging in the service.

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